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ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. VIII.

THE

ORCHIDS OF THE SIKKIM-HIMALAYA.

By

Sir GEORGE KING AND ROBERT PANTLING.

Mo. Bot. Garden,
1898.

CALCUTTA:

Printed at the Bengal Secretariat Press.

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Sir GEORGE KING, K.C.I.E., M.B., LL.D., F.R.S.,

Superintendent of the Royal Botanic Garden, Calcutta,

and

ROBERT PANTLING,

Deputy Superintendent of the Government Cinchona Plantation, Sikkim.

PART I.

LETTERPRESS.

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PART II.

PLATES OF MALAXIDEAE.

CALCUTTA:

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1898.

DEDICATED

TO

Sir Joseph Dalton Hooker,

G.C.S.I., C.B., F.R.S., D.C.L., OXON.; LL.D., CANTAB., EDIN., AND GLOTT.;

CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE,

ETC., ETC., ETC.,

AS A CORDIAL TOKEN OF ADMIRATION AND RESPECT.

ERRATA.

Page 1, *for* "4. DIDICEA" *read* "4. DIDICIEA."
„ 26, seventh line from top, *omit* "at" *before* "the sides and apex."
„ 28, to the localities where *Liparis tuberculata* occurs add "*Khasia Hills, Rita.*"
„ 36, Liparis Assamica; *for* plate "50" *read* "plate 53."
„ 42, third line from top, *for* "onneate" *read* "cuneate."
„ 49. In name of plate, *for* "*Dendrobium candidum*, Lindl." *read* "*D. candidum*, Wall."
„ 56. In description of *Dendrobium densiflorum*, Wall., seventh line from beginning, *for* "*revolute*" *read* "*convolute.*"
„ 64, second line, *add* to parenthesis "(*deciduous in B. polyrhizum*)" *and in B. triste.*
„ 64. In the diagnosis of *B. Griffithii*, *for* "striped," *read* "spotted."
„ 66, sixth line from top of page, *for* "lanceolote" *read* "lanceolate."
„ 83. In eleventh line from the bottom, *omit* the word "species" *after* Burmese.
„ 84, ninth line from the bottom, *for* "*Tribrachis hirta*" *read* "*Tribrachia hirta.*"
„ 86, 89, and 90, *for* "dimediattely" *read* "*dimidiately.*"
„ 89. In the eleventh line from the top, *for* "narrow," *read* "narrowest."
„ 93. In seventh line of description of *Cirrhopetalum caudatum*, *for* "2 in." *read* "·2 in."
„ 107. In top line *for* "triilobulate," *read* "trilóbulate."
„ 108. In description of *Phajus Wallichii*, ninth line, *for* "many-flowered" *read* "rather lax-flowered," and in third line of description of *P. Blumei for* "rather lax" *read* "many-flowered"
„ 110. *Phajus albus*, to citation "*Pl. As. Rar.*", *prefix* the words "*in Wall.*"
„ 111. *Acanthephippium sylhetense* in diagnosis *for* "4-lamellate" *substitute* "5-lamellate."
„ 111. In description of *Eria muscicola*, seventh line, *for* "Petals narrower than the petals" *read* "Petals narrower than the sepals."
„ 119. In fifth line of description of *Eria bambusifolia, omit the word* "broad."
„ 119. In first line of description of E. graminifolia, *omit* the word "and."
„ 121. Name of *Eria clausa, after* "Soc." *add* "Beng."
„ 123. In sixth line of description of *Eria acervata, after* "axils" *add* "of."
„ 124. In second line of description of *E. coronaria for* "Levaes" *read* "Leaves"
„ 135, sixth line from bottom, *for* "*Broughtonia liniaris*" *read* "*Broughtonia linearis.*"
„ 140, ninth line from bottom, *for* "*P. aiphylla*" *read* "*P. aphylla.*"
„ 153, third line from top, *for* "Flower" *read* "Flowers."
„ 155, fifth line from bottom, *for* "to this" *read* "of this."
„ 160, twenty-third line from top, *transpose* the word "*directly,*" so that the clause shall run thus—"*not attached to them directly by granular elastic threads.*"
„ 176. In fourth line of description of Plate of *Yoania Prainii, insert* the word "cap" *after* "anther;" thus *anther-cap.*
„ 183. *Remove* the citation (ninth line from bottom) "North-West Himalaya; at Simla, Gamble, 7,800 ft." from *Oreorchis foliosa* to *O. micrantha* in p. 184.
„ 192, eleventh line from top, *insert* the word "they" *before* "appear."
„ 205. In the first line of description of *Stauropsis undulata, omit* the words "like the peduncle."
„ 211, sixth line from the bottom, *re-arrange* these five words as follows:—*Slightly bifid and more dilated.*
„ 248, twenty-second line from the top, *omit* the word "and."
„ 250, name of plate, *change* "Corymbis veratrifolia, *Blume*" *to* C. veratrifolia, *Reichb. fil.*
„ 285. In diagnosis of *Z. sulcata for* "lip sub-orbicular, erose" *read* "lip sub-quadrate," and *delete* "*erose.*"
„ 285. In diagnosis of *Z. Goodyersides omit* the word "not."
„ 291, twenty-second line from the top, *for* "the processes in this being horizontal," &c., *read* "the processes of the lip in this being horizontal."
„ 326, ninth line from the top, *for* "Don in Wall. Cat." *substitute* Lindl. in Wall. Cat. (not of Don).

ERRORS IN THE INDEX TO THE PLATES IN PART II.

For "Cirrhopetalum candatum, *Wall.*" *read* "C. candatum, *King and Pantling.*"
For "Dendrobium candidum, *Lindl.*" *read* "D. candidum, *Wall.*"
Delete Microstylis ramosum, *Reichb. fil.*

ERRORS IN THE INDEX TO THE PLATES IN PART III.

For "Appendiculata bifaria, Lindl.", *read* "Appendicula bifaria."
For "Saccolabium acuminatum, *Lindl.*", *read* "S. acuminatum, *Hook. fil.*"

ERROR IN TITLE.

For KEEGAN *read* KEGAN.

ORCHIDEAE.

HERBS, sometimes scandent, (rarely shrubs), terrestrial with tuberous or fibrous roots, or epiphytic with aerial roots, with or without pseudo-bulbs, leafy or aphyllous. *Perianth* superior, irregular, in two whorls; the outer (*sepals*) usually sub-similar; the inner (*petals*) dissimilar, the odd one or lip variously shaped, often spurred. *Stamens* and *pistils* united into a column opposite the lip. *Anthers* solitary and perfect; or two each with one perfect and one imperfect cell or staminode (*Ophrydeae*); or both perfect (*Cypripedieae*); 2- to 4-celled; pollen-grains usually cohering into one two or four pairs of oblong, globose or pyriform, sessile or caudiculate masses (*pollinia*), the caudicles when present free or attached to one or two glands. *Perfect stigma* solitary, entire or bifid; or two, approximate or distant. Apex of *column* usually modified into a rostellum. Ovary inferior, usually half-twisted, sometimes completely twisted. Fruit capsular, 1-celled. Seeds very numerous, minute, with lax testa and homogeneous nucleus. A widely distributed family consisting of probably about 7,500 species.

Anther single—

Tribe I.—MALAXIDEAE. Pollinia 2 or 4, waxy, without appendages, free or rarely attached by their bases to a ball of translucent matter.

Tribe II.—EPIDENDREAE. Pollinia 4 or 8, waxy, attached by their bases or by their backs to a single or double granular or translucent appendage, but without any gland derived from the stigma.

Tribe III.—VANDEAE. Pollinia 2, 4, or rarely 8, attached singly or in pairs or in fours by a caudicle (rarely by two caudicles) to a viscid gland derived from the stigma (in a few doubtfully from the stigma).

Tribe IV.—LISTEREAE. *Anther* terminal (dorsal in *Epipactis*), *pollinia* two or four, cohering by their sides, without gland or caudicle (a rudimentary caudicle in *Epipogum*); pollen powdery, granular or in small masses, never waxy.

Tribe V.—GOODYEREAE. *Anther* posticous, vertical but inverted; *pollinia* two, or four in two pairs, attached to a single gland either by one or by two caudicles, or without a caudicle; pollen granular or sectile.

Anthers two, each with only one perfect cell—

Tribe VI.—OPHRYDEAE. *Anther-cells* sessile on the column, anticous or posticous, discrete or contiguous but always distinct, parallel or diverging, often with tubes from their bases, each with a staminode on its outer surface; *pollinia* two, rarely four, usually with caudicles and always with glands; the glands naked or enclosed in the same pouch or in two distinct pouches. *Stigmas* two, distinct or conjoined below the anther-cells; pollen granular or sectile, not waxy.

Anthers two, each perfect—

Tribe VII.—CYPRIPEDIEAE. Perfect anthers two, one on each side of the conjoined stigmas. Staminode single, large, fleshy; lip large, saccate.

PREFACE.

As regards the smaller and more obscure species of orchids indigenous to the Eastern Himalaya, the period prior to the publication of Sir Joseph Hooker's account of the family in his *Flora of British India* was to most people one of comparative darkness. Descriptions of a number of them indeed existed, but these were scattered in the volumes of periodicals many of which were accessible only to botanical experss. A large number of these descriptions had been brought together by Lindley in his fragmentary *Orchidology of India*, published in the Journal of the Linnean Society, and by Reichenbach *filius* in the sixth volume of Walper's *Annales*. But the identification of species by these means proved eminently uncertain and unsatisfactory. For many years Mr. Pantling had occupied his leisure by making drawings of the orchids found on the Government Cinchona Plantation in Sikkim, where he has lived since 1882. The appearance of the parts of the *Flora of British India* containing Sir Joseph Hooker's account of the family, gave an impetus to Mr. Pantling's studies; and when he showed his drawings to me, I most strongly urged him to continue the series until it should include one of each species found in the Cinchona Plantation and its immediate neighbourhood. The preparation of these drawings gradually worked itself into a project for the preparation of a complete Orchid Flora of the Sikkim-Himalaya; each species to be illustrated by a life-size figure of the plant, accompanied by analyses of the parts of the flower on an enlarged scale. The liberality of the Government of Bengal made it possible to publish the projected work in the Annals of the Calcutta Garden, and it now takes form in the present volume, which is the joint production of Mr. Pantling and myself.

The drawings from which the figures were lithographed were entirely the work of Mr. Pantling, my share in the production of these plates having been confined to the supervision of the lithographers who put them on the stone. For the exploration of the Alpine part of the country lying between the valley of the Great Rungeet and the higher snows, where it was believed some novelties might be found, a small party of trained Lepcha collectors was sent during the hot and rainy seasons of several successive years. These men were provided with a few swift coolies, by whom living plants of every species collected were quickly conveyed to Mr. Pantling who, while the plants were still fresh, made drawings of them. As a precaution, the collectors were provided with a stock of *Formaldehyd*, in a weak dilution of which they were instructed to preserve inflorescences of every species collected. These Lepcha collectors, as the following pages show, discovered a considerable number of species formerly unknown. For the letter-press Mr. Pantling and myself are jointly responsible.

Every botanist who has attempted to examine the flowers of dried specimens of orchids, and especially those of the smaller species, knows how very difficult it is to understand the structure of the column. For, in common with those of so many of the petaloid Monocotyledons, the flowers of orchids, owing to the delicacy of their tissues, lose their form during the process of drying, however carefully conducted; and they do not recover it when moistened for the purposes of study. It was therefore made a rule, when the preparation of this book was undertaken, that the drawing of every species should be made from a *living plant;* and the only exceptions to this rule (and they are very few) which have been made, occurred in cases where the living plants sent in from the higher regions by the collectors had, in spite of the precautions taken to keep them fresh, withered prior to their arrival at Mr. Pantling's house. In such cases the drawings of the flower were made from specimens preserved in *Formaldehyd.* In this excellent medium the *form* of flowers is exactly preserved; the colours, however, although in many cases remaining unaltered for some time, are found ultimately to fade. There may therefore be some departures from accuracy as to the exact coloration of the flowers of some of the Alpine species drawn from *Formaldehyd* specimens, but it is believed there are none in form. So strictly has the rule as to drawing only from living plants been observed, that neither figures nor descriptions have been given of species recorded from Sikkim (*e.g.*, *Odontochilus Clarkei* and *Cymbidium macrorhizon**), of which we were unable to collect living specimens. Several species which have large handsome flowers (*e.g.*, *Dendrobium primulinum*, *D. crystallinum*, and *D. Dalhousiænum*) recorded in the *Flora of British India* as occurring in Sikkim are believed now (probably on account of the extensive clearings for cultivation made within recent years) to be extinct. Such species have also been omitted from the book.

Three hundred copies of the book have been printed. In half the copies the lithographs have been lightly printed, and the flowers and their analyses have been coloured; in the other half the shading in the lithographs has been made darker, and they have not been coloured. The drawings have all been put on the stone by natives of Bengal educated at the Government School of Art in Calcutta. And the colouring has, under very careful supervision on Mr. Pantling's part, been done by the sons of Nepalese coolies employed on the Government Cinchona Plantations—boys who had never until Mr. Pantling took them in hand been accustomed to use any implement more delicate than a hoe. Mr. Pantling's perseverance and skill in drilling these boys into accurate colourists has been a standing marvel to everybody who has seen them at work.

In order that the species described in this volume might be represented in the great European herbaria, it was decided at the beginning of the undertaking that twelve authentically-named sets should be issued to herbaria in the different countries in Europe. These collections have just been distributed from the Calcutta Herbarium.

* This species was collected by one of us in the Runjeet valley in 1870, but has not since been met with in Sikkim.

They are by no means complete, but a list of the contents of each has been kept, and it is intended, from time to time, to fill up the blanks, so as ultimately to have every species represented in them. The specimens thus issued have been poisoned and mounted on cartridge paper, and each sheet has been examined by Mr. Pantling prior to issue; and, in token of his belief in the accuracy of its name, it bears his initials.

The herbaria to which these twelve sets have been issued are the following:—

Kew; British Museum; Jardin des Plantes, Paris; Royal Herbarium, Berlin; M. De Candolle's Herbarium, Geneva; Vienna (Hofmuseum); Brussels; Florence; St. Petersburg; Harward (United States of America); Leiden and Upsala.

The warmest thanks of Mr. Pantling and myself are due to Sir Joseph Hooker, G.C.S.I., F.R.S., for the interest which he has taken in the progress of the work, and for much encouragement and sagacious advice; to Mr. W. T. Thiselton Dyer, F.R.S., C.M.G., C.I.E., Director of the Royal Garden, Kew, for his courtesy in allowing comparisons of critical species to be made with the rich orchid collections of the Royal Garden by Mr. R. A. Rolfe, whose knowledge of orchids is so extensive; and to Mr. W. Botting Hemsley, F.R.S., of the same Herbarium, for kind assistance.

From my colleague, Dr. D. Prain, I have received much willing help and excellent advice during the progress of the work, and also in the issue of the named sets of specimens.

GEORGE KING.

Royal Botanic Garden,
Calcutta;
28*th February* 1898.

INTRODUCTION.

The morphology and classification of orchids have been so fully treated of in modern botanical literature that it appears to me to be quite unnecessary to burden these pages with any general account of either. I propose, therefore, here to allude only to a few matters, one morphologic, the others taxonomic, in which views divergent from those commonly accepted are given effect to in the following pages. The first matter is the morphology of the stamens in the Ophrydeous genera *Orchis*, *Habenaria*, *Herminium*, *Diplomeris* and *Satyrium*. According to the view of Robert Brown and Lindley, as well as of the latest writers Messrs. Darwin, Bentham and Hooker, Bolus, Rolfe, Pfitzer and Kräntzlin, the stamen is single in these genera. A minute examination of the Sikkim species convinces me that this is not the case; and that, in the Sikkim species at any rate, there are two stamens. This view is not, however, taken by Mr. Pantling, who is not satisfied with the proof of the hypothesis, and it is therefore published here on my own responsibility. According to the theory which holds the field, the orchidaceous flower consists of fifteen pieces, viz., three sepals, three petals (one of which is the lip), six anthers (in two alternating rows), and three stigmas; and, in all the sub-tribes except *Cypripedieae* only one of the six stamens is fertile. The fertile anther is said to be the middle one of the outer whorl (*i.e.*, the one opposite the odd sepal), the other two anthers of the outer whorl being represented by processes on the lip, and all the three of the inner whorl being merged in the column. One of the stigmas is supposed to be modified into the rostellum, and the other two to form the viscid stigmatic surface—a surface which, although usually simple, is in many cases bifid or quite divided into two segments. In the *Cypripedieae*, on the other hand, the fertile anthers are the lateral pair of the outer whorl, the odd one being converted into a large staminode, all the anthers of the inner whorl being infertile. The stigmas of *Cypripedieae* are all developed, but are confluent, none of them being modified into a rostellum.

If, however, the anther-cells of the Sikkim *Ophrydeae* be carefully examined, it will be found that it is difficult to explain their structure on the monantherous theory. For, although in some species the anther-cells lie close together, in many they are widely separated, the pollinia being also produced into long caudicles contained in canals, neither caudicles nor canals having any apparent attachment to a rostellum. Moreover, each of the fertile anther-cells bears on its outer surface a rugulose body which, in the descriptions in this and other works, is referred to as the *staminode*. *Habenaria stenopetala*, *H. geniculata*, *H. pectinata*, *H. malleifera*, *H. arietina* and *H. Dyeriana* are examples of species in which the fertile anther-cells are separated by a broad expanse

of cellular tissue, and of which the prolonged caudicles are enclosed in forward-projecting tubes, there being apparently no rostellum. These structural arrangements are seen in a still more pronounced form in *Diplomeris hirsuta*. They are also found in very many of the South African *Ophrydeae*, and they are very clearly shown in the excellent drawings of Mr. Bolus.* They culminate perhaps in *Habenaria Bonatea*, a remarkable South African species, the structure of the flowers of which has been figured with marvellous skill and delicacy by Francis Bauer in his well-known and magnificent drawings. The incompatibility of the monantherous theory with the arrangements in this and in other species of *Habenaria* appears to have struck Mr. Darwin, who refers to it in his book on the *Fertilization of Orchids* (pages 297 and 302, *first edition*), but he did not follow up the subject.

In my opinion the Sikkim species of *Ophrydeae* have really two anthers, one cell of each of which is fertile and the other cell infertile. The infertile cell invariably occupies a position on the outer surface of the fertile one, and is the body usually described as a "staminode".† The two fertile anthers belong in my opinion to the inner whorl, the infertile anther being merged in the column. In the Sikkim *Ophrydeae* one of the three stigmas is infertile, and the two lateral are fertile. These fertile stigmas are in many species quite distinct from each other; in other species they are conjoined into a simple or bi-lobed mass. The infertile stigma in many of the species is obscure; in others it forms a thickened and usually curved line running between the bases of the anther-cells. In *Habenaria stenantha* and *H. geniculata* it takes the form of a triangular concave plate occupying the lower part of the broad space betwen the bases of the anther-cells, but on a plane anterior to the web of cellular tissue by which these cells are connected with each other. The infertile stigma acquires its greatest development in *Diplomeris hirsuta*, in which (see description on page 338 and figs. 1 and 2 on plate 413) it forms a large concave hood placed well in front of the anther-cells, and (in a front view) hides the whole of the latter, except the extremities of the caudicles and their tubes. In this remarkable plant the two fertile pistils consist of two elongated parallel bodies, stigmatic at the apex, which overhang the claw of the lip and point downwards like the lip. The arrangement closely resembles that which obtains in the South African species of *Habenaria* of the section *Bonatea*.

The taxonomic matters in which there is in the following pages divergence from the current views, consist (*a*) in the restoration of Lindley's tribe *Malaxideae*, which has by most recent writers been merged in *Epidendreae*; (*b*) in the restitution to the tribe *Vandeae* of a few genera (hereafter mentioned in detail) which have of late been included in *Epidendreae*; (*c*) in the breaking up of the

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* *Orchids of South Africa*, and *Orchids of the Cape Peninsula*.

† I have examined many flowers and drawings of species of *Ophrydeae* in the hope of finding a species in which the infertile cells or staminodes are attached on the *inner sides* of the fertile cells. But the only case in which I have found such an appearance is in Mr. Bolus's drawing of *Pterygodium carnosum*, Lindl. (Orchids of the Cape Peninsula, t. 12, fig. 5). If the structures there represented as ovoid rugulose bodies really are staminodes, the fact affords a strong confirmation of my theory.

tribe *Neotticæ* into two tribes, which we have named *Listereae* and *Goodyereae*. In all these changes Mr. Pantling and myself are in agreement. We are both strongly of opinion that, in limiting the larger groups, it is (as far as the Sikkim species go) the safest course to assign a supreme value to the structure and appendages of the pollen masses. In working with fresh specimens we have found that, in the genera which we have included in the old tribe *Malaxideae*, the pollinia have absolutely no caudicle and no gland; and that, in the majority of cases, they are perfectly free from each other; in only a very few, viz., in three species of *Cirrhopetalum* and in the single species of *Diglyphosa*, being attached by their bases to a ball of translucent substance. In the genera which we have arranged in the tribe *Epidendreae* the pollen masses, on the other hand, are attached, either by their backs or by their bases, to a single or double translucent appendage, but have no gland derived from the stigma. It may be that this limitation will not be found to answer in the South American *Epidendreae;* and it is also possible that, from the extreme delicacy of the translucent appendages, the character may be one difficult to work in the Herbarium. However, as the present work professes to be based on dissections of living, and not on those of dried specimens; and, moreover, as the polliniar differences are accompanied by certain differences in the *facies* of the vegetative organs, we feel bound to give full prominence to them. And in doing so we are, as already indicated, only returning to the lines followed by that great orchidologist, John Lindley. The tribe *Epidendreae* passes into *Vandeae* by a transition suite of five genera (*Tipularia*, *Monomeria*, *Acrochæne*, *Agrostophyllum*, and a new one which we have named *Ritaia*), in all of which the polliniar appendages are attached to a gland the origin of which from the stigma is doubtful. The transfer of *Cryptochilus*, *Calanthe* and *Oreorchis* to *Vandeae* was forced upon us by the fact that the gland terminating the caudicle is, in all three, unmistakeably derived from the stigma. For this reason we have also restored to *Vandeae* the genus *Ione* which had been merged in *Bulbophyllum*,—a genus to which it has undoubtedly a great resemblance in its vegetative organs.

It only remains to say a few words in explanation of the re-arrangement of the genera formerly referred to *Neottieæ*. We found that these genera may, as we believe, be arranged in two groups by following the characters afforded by the pollen. In one group the pollen is powdery (very rarely granular); in the other it is always granular or sectile. The plants with powdery pollen have a terminal anther, and their pollinia cohere by their sides, but they have neither caudicles nor glands. These we have formed into a tribe under the name *Listereae*. The genera with granular or sectile pollen have a posticous anther, and the pollinia are attached to a single gland by either one or two caudicles. These we have formed into our tribe *Goodyereae*. The location in *Listereae* of *Epipactis* and *Cephalanthera* appears rather anomalous; and there is no doubt that, in their vegetative organs, they resemble no other genus in the group; but their pollen is unmistakably powdery.

Our study of the Sikkim species convinces us that the fertilization of orchids by insect agency is by no means so universal as is sometimes supposed. We have found

the most unmistakable evidence of self-fertilization in genera far removed from each other in every respect. Only a few examples need be mentioned here, as they are dealt with in the text. Such examples are *Eria excavata*, *Dendrobium crepidatum*, *Calanthe Mannii*. Most of the species in *Goodyereae*, notwithstanding that the pollinar appendages in this tribe appear to be suitably formed for removal by insect agency, are also self-fertile. The subject is one which we believe would yield most interesting results in the hands of a careful and patient observer.

GEORGE KING.

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Tribe I.—MALAXIDEAE.

Pollinia 2 or 4, waxy, without appendages, free or rarely attached by their bases to a ball of translucent matter.

* Pollinia 4—

* *Leaves equitant*—

Epiphytal; leaves fleshy, sessile; inflorescence terminal; flowers minute, in racemes or spikes; column very short, without appendages . . . *1. Oberonia.*

** *Leaves not equitant*—

Terrestrial; leaves membranous, usually sessile; inflorescence terminal; flowers small, in racemes or spikes; lip with basal (often very large) auricles; column very short, with broad arms . . . . . *2. Microstylis.*

Terrestrial or epiphytal; leaves 1 or 2, rarely more, membranous, sessile; inflorescence terminal, racemose, flowers small; lip without basal or side lobes; column long, with callosities or wings or with both; rostellum sometimes double . . . . . *3. Liparis.*

Terrestrial; leaf solitary, membranous, petioled; inflorescence terminal from a small pseudobulb; flowers minute, racemose; lip with a short spur, but without lobes or teeth; column without appendages . . . . . *4. Didicea.*

Epiphytal; coespitose (rhizomatous in sect. *Sarcopodium*); leaves two or more (rarely one), from pseudobulbs or stems, membranous or coriaceous; inflorescence terminal or axillary, in short few-flowered peduncles or in few- or many-flowered racemes; flowers usually large, brightly coloured; column without appendages, itself short, but with a more or less elongated foot forming with the lateral sepals a mentum or sac; pollinia of equal length . . . . . *5. Dendrobium.*

Epiphytal with a rhizome bearing pseudobulbs or solitary leaves (rhizome sometimes absent); leaves solitary and coriaceous, or in pairs and membranous; inflorescence a scape from the base of the pseudobulb or from the rhizome between pseudobulbs; flowers solitary or in heads, spikes, racemes or umbels; lip fleshy, tumid, jointed to the foot of the column, mobile, usually without side lobes; column short and stout, toothed towards the apex; foot short or long; inner pair of pollinia small.

Flowers rarely umbellate; lateral sepals not much longer than the dorsal, free; pollinia always free . . . . . *6. Bulbophyllum.*

Flowers usually umbellate; lateral sepals much longer than the dorsal and usually connate; pollinia sometimes attached to a ball of translucent substance . . . . . *7. Cirrhopetalum.*

Terrestrial; pseudobulbs with a long leafy pseudostem; leaves 3 to 5, sessile, membranous, plicate; inflorescence lateral, raceme branched; lip without side lobes or lamellæ, convolute; column long with no foot; pollinia free . . . . . *8. Anthogonium.*

**Pollinia 2—

Terrestrial, pseudobulbous from a short rhizome; leaves solitary, membranous, plicate, petioled; inflorescence a racemose scape; lip lamellate; column long, with or without foot—

Column with a deep sac or spur at its base and winged, with no foot; lip with side lobes; pollinia trapeziform; anther with a single apiculus; pollinia quite free . . . . . *9. Chrysoglossum.*

Column not saccate, wingless, foot long; lip without side lobes; pollinia elliptic, attached to a small translucent mass . . . . . *10. Diglyphosa.*

1. Oberonia, Lindl.

Epiphytes with usually very short, often tufted, stems. *Leaves* coriaceous or fleshy, usually ensiform (rarely terete), always distichous and equitant. *Flowers* minute, numerous, sometimes whorled, arranged in a long, erect or deflexed, spike-like or raceme-like inflorescence, but expanding centrifugally. *Sepals* sub-equal, ovate or oblong. *Petals* as wide as or narrower than the sepals. *Lip* larger than the sepals, sessile, rarely entire, usually lobed and often erose-lobular, the hypochile more or less concave or with a nectar-secreting pit near its base. *Column* very short, stout, rarely winged. *Anther* terminal, incumbent; pollinia 4, cohering in pairs. A genus of about 60 species distributed in the Indo-Malayan region, but extending also to Australia and the islands of the Pacific.

Note.—In none of the living specimens of *Oberonia* which we have examined are the pairs of pollinia connected in any way with the rostellum. The rostellum has, however, at its extremity a minute globule of transparent viscid matter, and immediately above this lie the attenuated ends of the pollen masses. So closely do these approximate to each other that contact between them may be caused by the slightest movement of an insect in the neighbourhood, or even by the wind. Contact is probably also caused as the anther shrivels and the pollinia thus get displaced from their natural bed on the clinandrium. In dried specimens of *Oberonia* the pollinia are almost invariably attached to this rostellar viscus, and it is this circumstance which has probably given rise to the belief that they were originally connected in the living state by a viscus of their own.

* Lip without lateral lobes or basal auricles.

Lip coarsely erose from base to apex; rachis of inflorescence slender.

Apex of lip not lobulate; petals spreading, erose-dentate . . . *1. O. Prainiana.*

Apex with two short lobules separated by a rather wide sinus; petals reflexed, entire . . . . . *2. O. lobulata.*

Lip quite entire or very slightly erose at the apex only; petals entire, axis fleshy . . . . . *3. O. pachyrachis.*

** Lip with narrow lateral lobes; terminal lobe not elongate.

Axis of the raceme fleshy.

Lateral lobes of lip dentate; terminal lobe rounded, entire . *4. O. pachyphylla.*

Axis of the raceme not fleshy.

Lateral lobes of lip quite entire; terminal lobe large with lobulate-erose edges and a slightly bifid apex; sepals and petals spreading. 5. *O. emarginata.*

Lateral lobes sub-entire, concave; terminal lobe erose-dentate, its apex minutely mucronate; petals reflexed . . . . . 6. *O. micrantha.*

Lateral lobes erose-dentate; terminal lobe with two blunt slightly incurved apical lobules separated by a sinus . . . . . 7. *O. Croftiana.*

*** Lip broad, rounded or oblong in general outline; the side lobes large.

Lateral lobes pectinate, glabrous.

Terminal lobe entire except for a slight erosion at the apex . . 8. *O. Jenkinsiana.*

Terminal lobe coarsely erose-dentate . . . . . 9. *O. iridifolia.*

Lateral lobes entire, clothed with stiff hairs and separated from the bifid hairy apical lobe by a smooth mesochile . . . . . 10. *O. ensiformis.*

**** Lip with distinctly projecting lateral or basal lobes, their apices directed either outwards or forwards (towards the apex), or upwards and backwards.

Lateral lobes directed forwards.

Lateral lobes oblong, blunt.

Lateral lobes erose-dentate; terminal lobe emarginate, erose . 11. *O. demissa.*

Lateral lobes entire; terminal lobe obcordate . . . . . 12. *O. obcordata.*

Lateral lobes sub-crenulate; terminal lobe deeply cleft into two broadly oblong blunt lobes; surface of the lip blistered or scaly . . . . . 13. *O. myriantha.*

Lateral lobes falcate, their apices acute and directed forwards.

Terminal lobe with falcate parallel lobules; petals truncate . 14. *O. parvula.*

Terminal lobe with caudate-acuminate straight parallel lobules; petals acute . . . . . 15. *O. caulescens.*

Lateral lobes directed horizontally outwards, small and conical; terminal lobe with rather falcate but short divergent lobules; petals blunt . . . . . 16. *O. falcata.*

Lateral lobes long and filiform, curved upwards and backwards; terminal lobe with lanceolate elongate parallel lobules, the whole surface of the lip scaberulous . . . . . 17. *O. rufilabris.*

***** Lip lobed only at the apex; its base broad and sometimes sub-truncate with a small auricle at each extremity; the apex with two long falcate lobules separated by a deep sinus.

Petals spreading; stems elongate.

Petals linear-oblong, truncate, entire, sepals spreading . 18. *O. longilabris.*

Petals oblong, erose, spreading; lateral sepals reflexed . 19. *O. auriculata.*

Petals reflexed; stem very short . . . . . 20. *O. pyrulifera.*

1 Oberonia Prainiana, King and Pantling in Journ. As. Soc. Bengal, LXIV, *pt.* 2, *p.* 331.

Stem very short; *leaves* very fleshy, oblong, slightly falcate, sub-acute, ·5 to ·8 in. long and ·15 to ·25 in. broad. *Spike* slender, erect, many times longer than the leaves; the peduncle sparsely bracteate, twice as long as the uppermost leaf to which it is adnate; the rachis much longer than the peduncle, rather densely-

flowered in the lower two-thirds, laxly-flowered in the upper third; *floral bracts* equalling and sheathing the stout sessile ovary, oblong, sub-entire. *Flowers* warm brown, minute, ·05 in. long, whorled. *Sepals* oblong, blunt, entire, revolute. *Petals* narrowly elliptic, sub-acute, coarsely and unequally serrate, spreading. *Lip* not much longer than the sepals, elliptic-lanceolate, blunt, not distinctly lobed but everywhere irregularly lobulate-erose; the base truncate and with a circular nectar-bearing pit just under the column. *Pollinia* orange-coloured.

At the mouth of the Teesta valley near Sivoke, elevation about 1,000 feet; Pantling No. 225; only once collected; in flower during April and May. Distrib.—Perak; Scortechini, No. 582.

A singularly beautiful little species with charming warm-brown flowers. It is evidently a straggler northwards of the Malayan Flora, only a single specimen of it having as yet been collected in British India, and that at a spot on the outer flank of the Himalaya. Father Scortechini, who collected for several years in Perak, has left an excellent pencil drawing of the Perak plant, which, as well as his manuscript description, agrees with the Sikkim plant. This is closely allied to O. *Bertoldi*, King and Pantling, another species of which Father Scortechini collected specimens in Perak, and of which he left a drawing now in the Calcutta Herbarium.

PLATE I.—*Oberonia Prainiana*, King and Pantling. A plant *of natural size*. Fig. 1 front view of flower, 2 a flower in profile, showing the recurved sepals, 3 lip, 4 column with the reflexed lateral sepals *in situ*, 5 anther, 6 pollinia; *all enlarged*.

2. OBERONIA LOBULATA, *new species*.

Stems very short, not tufted. *Leaves* oblong, acute or sub-acute, very slightly falcate, ·75 to 3 in. long and ·25 to ·50 in. broad. *Inflorescence* more than twice as long as the leaves, decurved; the peduncle 1·5 in. long, winged, ebracteate; the rachis slender, sub-terete, laxly-flowered; *floral bracts* equalling and sheathing the sessile ovary, broadly oblong, with a blunt triangular erose apex. *Flowers* scattered, solitary, green, minute, (·08 in. long). *Sepals* ovate, acute, the *petals* narrower; all entire, reflexed, and resting on the ovary. *Lip* twice as long as the sepals, sub-quadrate, narrowed towards the apex; the base broad, truncate; the edges irregularly dentate-lobulate from base to apex; the apex with a shallow broad sinus. *Stigma* convex.

In a tropical valley in the Sikkim Himalaya at an elevation of 1,000 feet; only a single specimen found; Pantling, No. 199; in flower during October.

The lip of this might be described as trowel-shaped with a truncate bilobed apex, the lobes being separated by a wide shallow sinus.

PLATE 2B.—*Oberonia lobulata*, King and Pantling. A plant; *of natural size*. Fig. 1 a flower, *front view*, 2 floral bract, flattened out, 3 pollinia of a young flower intact within the anther-cells; *all enlarged*.

3. OBERONIA PACHYRACHIS, Reichb. fil. in Herb. Kew ex Hook. fil. Fl. Br. Ind. V, 681.

Stems very short, tufted. *Leaves* ensiform, slightly falcate, tapering to the base, the apex acute, 1·5 to 4 in. long and ·25 to ·65 in. broad. Peduncle of *inflorescence* short, broad, compressed, adnate to a leaf to near its apex; the flower-bearing rachis very

fleshy, terete, tapering, erect, equalling or slightly longer than its leaf; *floral bract* ovate-rotund, irregularly but deeply serrate. *Flowers* minute (only ·04 in. long), pale brown, sunk singly in rather distant pits in the fleshy rachis, the sepals and lip lying flat on its surface. *Sepals* elliptic, obtuse, glandular on the back, not reflexed. *Petals* smaller than the sepals, linear-oblong, obtuse, sub-entire. *Lip* orbicular-elliptic, obtuse, concave, quite entire or very slightly erose at the apex, and with a deep depression at the base just under the column. *Capsule* short, turgid, often gibbous.

Sikkim at elevations of from 2,000 to 4,000 feet, Pantling No. 105; extending westwards along the tropical zone of the Himalaya to Gharwal and Dehra Dun—Vicary, Gamble. Khasia Hills—G. Mann. Flowering in Sikkim from November to March.

This species is very closely allied to *O. orbicularis*, Hook. fil., from which it is distinguished only by its more distant and rather smaller flowers, which have narrower petals and broader and much more irregularly toothed bracts. We have not found any *Oberonia* in Sikkim having exactly the characters of *O. orbicularis*, as they are given by Sir Joseph Hooker in his Flora of British India, or in his Century of Orchids (Ann. Bot. Gard. Calc., Volume V, 1, t. 1, where he describes and figures the species). The only locality given for it in Sikkim is Dikkiling, to which we venture to think it may have been attributed by some misplacement of collectors' labels. At all events, we have failed to meet with it in Sikkim of recent years. The specimen of the plant which was the first to receive a name was collected in 1836 in the Khasia Hills by Mr. Gibson (a collector sent out by the Duke of Devonshire). It was sent to the Botanic Garden, Calcutta, to Dr. Wallich, who had a figure made of it, which still exists in the Herbarium, and on which is written, in Wallich's handwriting, "*O. phyllostachys*"—a name of which Sir Joseph Hooker did not know the existence when he published the species as *O. orbicularis* in the Flora of Brit. India (vol. V, 677).

The flowers of *O. orbicularis* as figured by Sir Joseph Hooker (*l.c.*) have larger sepals, larger and differently-shaped petals from those of the Sikkim plant here figured. Moreover the floral bract is ovate acute and regularly finely serrate in that, whereas in this it is almost rotund and irregularly erose-serrate. Sir Joseph's figure shows besides a raised fleshy margin to the nectary—a character which is wanting in this. *O. orbicularis* is probably confined to the Khasia Hills.

PLATE 3.—*Oberonia pachyrachis*, Reichb. fil. A plant; *of natural size.* Fig. 1 front view of a flower, 2 floral bract, 3 anther, 4 pollinia; *all enlarged.*

4. OBERONIA PACHYPHYLLA, *new species.*

Stems very short, not tufted. *Leaves* very fleshy especially at the base, broadly lanceolate, acute, ·5 to 1 in. long and from ·2 to ·5 in. broad at the base. *Peduncle of the inflorescence* short, stout, not adnate to a leaf, with one to three lanceolate hyaline bracts. *Spike* 1·25 in. long, deflexed, thick, fleshy, terete, tapering towards the apex and also slightly towards the base. *Flowers* ·04 in. long, not sunk in the rachis, covered while in bud by the broad ovate-rotund erose fleshy-based bracts. *Sepals* spreading, broadly-ovate, blunt, entire. *Petals* spreading, ovate-lanceolate, blunt, entire. *Lip* slightly shorter than the sepals and petals, obovate-rotund, with a deep pit at its base just under the column; the margin 3-lobed; the side lobes long, very narrow, erose-dentate; the terminal lobe rounded, quite entire.

Near the base of the Sikkim-Himalaya, at Salgurra, near Siliguri; elevation 900 feet; Pantling No. 429; only once collected; in flower in February.

The sepals and petals are of a pale reddish-brown, the lip being of a much darker shade of the same colour. In its thick fleshy terete rachis this species resembles *O. pachyrachis*, Reichb. fil.; and *O. orbiculuris*, Hook. fil.; but it differs from both in having the inflorescence quite free from any leaf, whereas in both these the peduncle of the inflorescence is adnate to a leaf. Moreover, in both these species, the flowers are sunk in pits in the rachis; in this they are quite superficial. The leaves in this are also much shorter and more fleshy. The flowers of this are very like those of *O. orbicularis* as figured by Sir Joseph Hooker (Ann. Bot. Gard. Calc. V, t. 1); but, in that species, the lip has no side lobes and is entire; or, if in the least degree erose, it is so at the apex and not at the sides or base; whereas in this there are three lobes, and the apical one is quite entire, while the lateral lobes are very erose. From the flowers of this, those of *O. pachyphylla* differ in having much narrower petals and also somewhat narrower sepals.

PLATE 4.—*Oberonia pachyphylla*, King and Pantling. Two plants; *of natural size*. Fig. 1 flower, *front view*, 2 floral bract, 3 anther, 4 pollinia; *all enlarged*.

5. OBERONIA EMARGINATA, *new species*.

Stems slightly exceeding an inch in length. *Leaves* linear, falcate, sub-acute, length ·35 to 1·35 in., breadth ·1 to ·15 in. *Peduncle* short, with many minute linear bracts; *raceme* about twice as long as the leaves, decurved, densely-flowered for five-sixths of its length, but laxly-flowered in the apical sixth. *Flowers* very minute (less than ·02 in. long), verticillate; floral bract ovate-lanceolate, with a broad base and acute apex, entire, longer than the ovary. *Sepals* and *petals* sub-equal, spreading, broadly ovate, acute, slightly narrowed to the base, the margins entire. *Lip* about equal in length to the sepals and petals, but broader, sub-orbicular in general outline, with a shallow depression at the base below the column, 3-lobed; the basal lobes small, rounded, entire; the terminal lobe large, with lobulate erose edges, the apex bifid, the sinus triangular. *Anther* transversely elliptic, pollinia ovoid.

Sikkim, at Namgah, elevation 6,000 feet; Pantling No. 423; in flower during September.

This species is allied to *O. micrantha*, King and Pantling, from which it differs in being caulescent, in having falcate leaves, and in having the floral bract entire and broader. The terminal lobe of the lip is moreover different in shape, and the sepals are smooth on the outer surface instead of being papillose as they are in *O. micrantha*.

PLATE 2A.—*Oberonia emarginata*, King and Pantling. Three plants; *of natural size*. Fig. 1 a flower, *seen from the front*, 2 floral bract, *spread out*, 3 anther, 4 pollinia; *all enlarged*.

6. OBERONIA MICRANTHA, *new species*.

Stems very short. *Leaves* linear-ensiform, sub-acute, not falcate, length ·35 to 1·35 in., breadth ·1 to ·2 in. *Inflorescence* erect, longer than the leaves, slender, terete; the peduncle very short, bracteolate; the flowering-rachis four times as long as the peduncle; floral bract lanceolate, sub-acute, slightly erose, equal in length to or slightly exceeding

the ovary. *Flowers* very minute (·35 in. long) whorled. *Sepals* broadly ovate, spreading, entire, minutely papillose externally. *Petals* narrower than the sepals, ovate, entire, recurved. *Lip* broad, sub-rotund in general outline, divided into a basal and apical part by deep lateral sinuses; the basal part concave, fleshy but with no nectary, its two lobes rounded and sub-entire; the apical part or lobe thinner than the basal, transversely elliptic, erose-dentate, its apex minutely mucronate.

Sikkim Himalaya, at Tendong, elevation 6,000 feet; Pantling No. 324; in flower in July.

A species allied to *O. demissa*, Lindl., but with different leaves, a tapering, not truncate, inflorescence, and a different lip; allied also to *O. emarginata*, King and Pantling, but differing in the points noted under that species.

PLATE 5.—*Oberonia micrantha*, King and Pantling. Three plants, *of natural size*. Fig. 1 a flower, *front view*, 2 floral bract, 3 anther, 4 pollinia; *all enlarged*.

7. OBERONIA CROFTIANA, *new species*.

Stems very short, tufted. *Leaves* only slightly fleshy, shortly and broadly ensiform, tapering from below the middle to the acute apex, straight or sub-falcate, ·75 to 1·5 in. long. *Peduncle of inflorescence* terete, stout, shorter than the leaves, bracteate; the raceme terete, usually much longer than the leaves (often twice as long), erect at first, afterwards much decurved; the rachis thick and deeply grooved when the fruit is ripe; floral bract elliptic, sub-acute, crenulate or sub-entire, equalling the shortly-stalked ovary. *Flowers* reddish-brown, minute (about ·05 in. long). *Sepals* ovate-cordate, entire, spreading. *Petals* oblong, blunt, sub-crenulate or entire. *Lip* much larger than the sepals or petals, oblong, 3-lobed, with a large depression near the base; lateral lobes narrow, erose-dentate, the terminal lobe with two long blunt slightly incurved apical lobules separated by a deep blunt sinus.

On the Sikkim-Bhotan frontier, on the banks of the Jaldakha river; elevation about 900 feet; Pantling No. 254: in flower during October.

This is allied to *O. Falconeri*, Hook. fil., but is a smaller plant with thinner leaves. This has moreover oblong obtuse petals which are often sub-crenulate, whereas the petals of *O. Falconeri* are lanceolate-acute and quite entire. The lateral lobes of the lip of this are elongate, narrow and erose-dentate, whereas those of *O. Falconeri*, as figured by Sir Joseph Hooker (Ic. Plantar., t. 1780), are short, ovate-rotund and entire. This is also allied to *O. parvula*, King and Pantling, but that has a different lip and is a smaller plant with its inflorescence always erect.

PLATE 6*A*.—*Oberonia Croftiana*, King and Pantling. Three plants, *of natural size*. Fig. 1 front view of a flower, 2 floral bract, 3 pollinia; *all enlarged*.

8. OBERONIA JENKINSIANA, Griff. MSS. ex Hook. fil. Fl. Br. Ind. V, 676.

Stems about 1 or 1·5 in. long, tufted. *Leaves* narrowly ensiform, sub-acute, straight or sub-falcate, 2 to 5 in. long and ·25 in. broad. *Inflorescence* decurved, produced from about the middle of the uppermost leaf and about equal to the longest leaf in length; *peduncle* terete, bracteate; raceme three times as long as the peduncle, densely-flowered, the rachis fleshy; floral bract ovate, acuminate, erose, equalling the shortly-stalked ovary. *Flowers*

minute (·06 in. long), brown, verticillate. *Sepals* and *petals* sub-equal, broadly ovate, obtuse or sub-acute, entire, spreading. *Lip* fleshy, much larger than the sepals and petals, 3-lobed; the basal lobes large, auriculate, pectinate, with an elliptic nectar-secreting concavity between their anterior ends; the terminal lobe rather smaller, reniform, entire except for a shallow elongate sub-mucronate erosion at the apex. *Clinandrium* much broader than the anther; *pollinia* resting on the minute projecting viscid rostellum. Lindl. Fol. Orchid. Oberonia, p. 4. *Malaxis Jenkinsiana*, Reichb. fil. in Walp. Ann. VI, 211.

Sikkim, in the valley of the Teesta; elevation about 1,000 feet. Pantling No. 185. Distrib. Khasia Hills up to 4,000 feet; Clarke, Hooker and Thomson.

Plate 7.—*Oberonia Jenkinsiana*, Griff. A plant, *of natural size*. Fig. 1 front view of a flower, 2 floral bract, spread out, 3 anther, 4 pollinia; *all enlarged*.

9. Oberonia iridifolia, Lindl. Gen. and Spec. Orchid., 15.

Stem short. *Leaves* broadly ensiform, acute, 2 to 10 in. long and ·25 to 1 in. broad. *Inflorescence* longer than the leaves, decurved; *peduncle* winged, ebracteate; *spike* twice (sometimes three times) as long as the peduncle, its rachis rather slender, densely-flowered; *floral bract* minute, elliptic, obtuse, coarsely erose, convolute round the sessile ovary. *Flowers* minute (·06 in. long), sub-verticillate, pale green or yellow. *Sepals* and *petals* sub-equal, ovate, reflexed and resting on the ovary, the former entire, the latter erose. *Lip* orbicular, indistinctly 3-lobed; the side lobes pectinate, erose; the terminal lobe broad, transversely oblong, deeply and bluntly emarginate at the apex and coarsely erose. *Capsules* broadly ovoid, sessile. Folia Orchid. Oberonia, p. 1. Wall. Cat. No. 1948-2 (*in part only*); Hook fil. Fl. Br. Ind. V, 675. *Malaxis iridifolia*, Reichb. fil. in Walp. Ann. VI, 208.

Common in the tropical valleys of the Sikkim and Bhotan Himalaya; Pantling No. 13. Also in the hill ranges of Assam and Burma, and in the Andaman Islands. In flower in Sikkim from September to December.

This is a widely-distributed and variable species; but only the typical form, as above described, occurs in Sikkim. Sir Joseph Hooker (Fl. Br. Ind. V, 676) recognises three varieties, viz., var. *denticulata*, found in the Nilgiri and Pulney ranges of hills; var. *angustifolia*, from the Khasia Hills; and var. *brevifolia*, from Burma and the Andamans.

Plate 8.—*Oberonia iridifolia*, Lindl. *forma typica*. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 a flower, *side view*, 3 floral bract, flattened out, 4 anther, 5 pollinia; *all enlarged*.

10. Oberonia ensiformis, Lindl. Fol. Orchid. Oberonia, p. 4.

Stem about 3 in. long. *Leaves* linear-ensiform, acuminate, falcate, length 3 to 18 in., breadth ·5 to ·75 in. *Inflorescence* erect, shorter than the leaves, its apex sub-truncate, its peduncle 2 to 3 in. long and bearing numerous minute lanceolate adpressed pale bracteoles; the *raceme* about twice as long as the peduncle; its rachis thick, fleshy, terete; *floral bract* longer than the ovary, convolute, ovate-rotund, sub-acute, erose. *Flowers* ·12 in. long, pale brown, not at all sunk in the rachis. *Sepals* sub-equal, broadly ovate, sub-acute, entire, not ciliolate, reflexed. *Petals* ovate, sub-acute, stiffly pubescent, the edges entire and ciliolate. *Lip* twice as long as the sepals, 3-lobed, with two large rounded entire basal lobes, a sub-quadrate smooth slightly concave mesochile which

bears on its edges two large projecting blister-like processes, and an ob-reniform terminal lobe with two rounded lobules separated by a broad sub-quadrate apical sinus; the whole surface and margins of the lip except the smooth mesochile clothed with stiff hairs. Hook. fil. Fl. Br. Ind. V, 679. *O. acaulis*, Hook. Bot. Mag., t. 5056 (not of Griff.). *O. trilobata*, Griff. Notul. III, 273. *Malaxis ensiformis*, Smith in Rees' Encycl.; Reichb. fil. in Walp. Ann. VI, 212 (excl. syn.).

Sikkim, in the valley of the Teesta, at an elevation of about 1,500? feet; Pantling No. 305; in flower in November. Nepal; Hamilton. Khasia Hills; Griffith. Nilgiri Hills; Proudlock.

This is the largest species of *Oberonia* found in Sikkim; it has the peculiarity of having all its leaves curved in the same direction. It falls into the group with *O. myriantha*, Lindl. and *O. ferruginea*, Parish, its nearest ally being probably the latter, from which, however, it differs conspicuously in having its petals and lip entire instead of fimbriate. The basal lobes of the lip, moreover, are broad, not narrow as in *O. ferruginea*, and the apical sinus is obtuse, instead of acute as in that species. Specimens recently received from Mr. R. L. Proudlock, collected by him in the Nilgiri Hills, exactly agree with those collected in Sikkim. It had not been previously suspected that *O. ensiformis* occurred in Southern India.

PLATE 9.—*Oberonia ensiformis*, Lindl. A plant; *of natural size*. Fig. 1 front view of a flower, 2 sepals and petals separated from the rest of the flower, 3 floral bract, flattened out, 4 pollinia; *all enlarged*.

11. OBERONIA DEMISSA, Lindl. Fol. Orchid., Oberonia, p. 4.

Stem very short. *Leaves* narrowly oblong, tapering to the sub-acute apex and also slightly to the base, sub-falcate, ·5 to 3 in. long and ·25 to ·5 in. broad. *Inflorescence* about as long as the longest leaves, erect or decurved; the *peduncle* about ·25 in. long, ebracteate, axillary; the *raceme* five or six times as long, truncate at the apex, densely-flowered; the *rachis* rather stout; *floral bract* as long as the shortly-stalked ovary, lanceolate, sub-acute, its edges obscurely crenulate. *Flowers* minute, (·05 in. long) reddish-brown, densely whorled. *Sepals* sub-equal, ovate, entire, all reflexed and lying on the ovary. *Petals* elliptic, obtuse, erose-dentate, spreading. *Lip* equalling the sepals in length but much broader, 3-lobed; the lateral lobes oblong, blunt, falcate, erose-dentate, divergent; the terminal lobe quadrate, orbicular, with broad emarginate apex and erose-dentate edges. Hook. fil. Ic. Plantar., t. 1785 B; Fl. Br. Ind. V, 680. *Malaxis demissa*, Reichb. fil. in Walp. Ann. VI, 211.

Tropical valleys in the Sikkim Himalaya; Hooker, Pantling, No. 238.

PLATE 10.—*Oberonia demissa*, Lindl. Two plants, *of natural size*. Fig. 1 front view of flower, 2 flower in profile, 3 floral bract, flattened out, 4 pollinia; *all enlarged*.

12. OBERONIA OBCORDATA, Lindl. Fol. Orchid., Oberonia, p. 7.

Caulescent; the *stems* short and many-leaved, or 1·5 to 3 inches long and fewer-leaved, fleshy, compressed. *Leaves* linear, falcate, acute, fleshy, ·75 to 1·75 in. long. *Peduncle of inflorescence* short, with a few bracts or with none; *raceme* slender, as long as the longest leaf; *floral bract* larger than the flower, ovate-lanceolate, acuminate, minutely and irregularly toothed. *Flowers* reddish-brown, about ·05 in. long, in dense whorls,

densest towards the base of the raceme. *Sepals* sub-equal, broadly ovate, the dorsal acute, the lateral pair obtuse. *Petals* linear-oblong, sub-acute, spreading. *Lip* much longer and broader than the sepals, with an oblong narrow mesochile ridged in the middle, two oblong blunt entire divergent lateral lobes, and a large ob-reniform terminal lobe, the sinus shallow and wide making the apex broadly bilobulate, the edges entire. Hook. fil. Ic. Plantar., t. 1783; Fl. Br. Ind. V, 684. *Malaxis obcordata*, Reichb. fil. in Walp. Ann. VI, 216.

Sikkim-Himalaya, at elevations of from 5,000 to 9,000 feet; Griffith, Hooker, Clarke and other collectors; Pantling No. 47. Khasia Hills, alt. 5,000 feet; Griffith, No. 5087. Naga Hills, on Japhoo, elev. 9,000 feet, Colomb. In flower in Sikkim from June to October.

This species is very variable in habit. Some specimens have only a single leaf; some have short stems and five or six leaves crowded close together, while others have stems one and a half to three inches long with three or four distant leaves. The caulescent forms are occasionally viviparous, and the whole plant is usually more or less suffused with reddish-brown. We believe *O. Treutleri*, Hook. fil., to be a form of this. The same form was recognised by Reichenbach fil. as a variety of this under the name var. *latifolia*. The nectary, which in most species of *Oberonia* is in the form of a concavity near the base of the lip, is in this a tunnelled ridge on the mesochile, with a single very minute opening at the end next the stigma. This remarkable arrangement was discovered by Mr. Pantling after the examination of numerous living flowers. The species is a very common one in Sikkim.

PLATE 11.—*Oberonia obcordata*, Lindl. Three plants, *of natural size*. Fig. 1 front view of a flower, 2 floral bract opened out, 3 pollinia, complete, 4 profile of two pollinia; *all enlarged*.

13. OBERONIA MYRIANTHA, Lindl. Fol. Orchid., Oberonia, p. 4.

Stems short, slightly tufted. *Leaves* ensiform, acuminate, falcate, very unequal in size, from ·75 to 10 in. long and ·15 to ·5 in. broad. *Inflorescence* much longer than the leaves, slender, much decurved; its peduncle terete, rather thickly clothed with slightly-spreading linear bracts; the rachis of the raceme not thicker than the peduncle but several times as long; floral bract lanceolate, acuminate, coarsely erose-fimbriate, equalling the long-stalked ovary. *Flowers* of a warm brown colour, ·1 in. long, very numerous, more or less whorled. *Sepals* ovate, entire. *Petals* oblong, entire, truncate, spreading or reflexed on the ovary like the sepals. *Lip* longer than the sepals and petals; the lateral lobes broadly oblong, sub-crenulate, blunt, sub-divergent but pointing forwards; the terminal lobe large, deeply cleft into two broadly oblong blunt lobules separated from each other by a triangular blunt or acute sinus; the upper surface of the lip with a few irregularly scattered watery blisters ultimately changing into scales, and also with a small shallow depression at the base just under the column. *Capsules* cylindric clavate, boldly ribbed, pediceiled. Hook. fil. Fl. Br. Ind. V, 679. *O. Sikkimensis*, Lindl. Fol. Orch., Oberonia, 4. *O. acaulis*, Griff. Notul. III, 275; Itin. Notes 76, No. 1130; Ic. Pl. Asiat., t. 286, fig. 1. *Malaxis myriantha* and *M. Sikkimensis*, Reichb. fil. in Walp. Ann. VI, 212.

Valleys of the Sikkim-Himalaya; at elevations of 3,000 to 4,000 feet; common: Pantling No. 195; in flower in Sikkim from October to December. Khasia Hills, elevation 3,500 to 5,000 feet. Naga Hills, Clarke.

PLATE 12.—*Oberonia myriantha*, Lindl. A plant, *of natural size*. Fig. 1 front view of a flower, 2 column, 3 floral bract, 4 anther, 5 and 6 pollinia; *all enlarged*.

14. OBERONIA PARVULA, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, pt. 2, p. 330.

Whole plant under two inches in height, not tufted, or only very slightly so. *Leaves* two or three, lanceolate, acute, ·5 to nearly 1 in. long, and ·12 to ·25 in. broad. *Inflorescence* erect, twice as long as the leaves; the *peduncle* slender, ebracteate, about half as long as the thickened terete tapering raceme; *floral bract* equalling the shortly-stalked ovary, oblong-lanceolate, sub-mucronate, the edges crenulate. *Flowers* minute (·06 in. long), crowded but not whorled. *Sepals* ovate, sub-acute, the upper one entire; the lateral pair rather larger and more spreading, keeled and with wavy edges. *Petals* oblong, truncate, entire, spreading, pale yellow and translucent like the sepals. *Lip* reddish-brown, broadly obovate in general outline, with a concavity near the base, 3-lobed; the lateral lobes small, apically-pointing, falcate-triangular, sub-acute; the terminal lobe long, deeply bifid, its sub-falcate lobules separated by a deep wide sinus mucronate at its apex. *Stigma* convex.

In the Teesta Valley, at Guru Bathan, elevation 1,500 feet; Pantling No. 203; in flower in February.

This, like *O. lobulata*, has a convex stigma.

PLATE 6B.—*Oberonia parvula*, King and Pantling. Two plants, *of natural size*. Fig. 1 front view of a flower, 2 floral bract, flattened out, 3 anther, 4 pollinia; *all enlarged*.

15. OBERONIA CAULESCENS, Lindl. Fol. Orchid., Oberonia 7.

Stems 1 to 2 in. long. *Leaves* about five, linear-ensiform, acute or acuminate, rather fleshy, ·5 to 1 in. long and ·15 to ·2 in. broad. *Inflorescence* erect, not adnate to a leaf, twice as long as the longest leaf; its *peduncle* terete, short, bracteate; the *raceme* slender. *Flowers* reddish-brown, minute (·05 in. long), verticillate in the lower three-fourths of the raceme, sparse and irregular in the upper fourth; *floral bract* equal in length to the stalked ovary, lanceolate, its apex aristate. *Sepals* ovate, sub-acute, entire. *Petals* lanceolate, acute, entire, spreading like the sepals. *Lip* nearly three times as long as the sepals, 3-lobed and with a small deep elliptic depressed nectary at its base just below the column; lateral lobes triangular-falcate, their apices pointing forwards; terminal lobe deeply cleft at its apex into two caudate-acuminate sub-parallel lobules separated by a deep narrow sinus mucronate at its apex. Lip of *anther* acute. Lindl. in Wall. Cat. 1950; Gen. and Spec. Orchid., 15; Hook. fil. Fl. Br. Ind. V, 683. *Malaxis caulescens*, Reichb. fil. in Walp. Ann. VI, 215.

Sikkim; common at elevations of about 6,000 feet; Pantling No. 454; in flower during July and August. Nepal; Wallich. Khasia Hills; Lobb, Hooker fil., and T. Thomson.

The nearest ally of this is probably *O. caudata*, King and Pantling, a species from Perak recently described in the Journal of the Asiatic Society of Bengal; but in that species the peduncle is adnate to a leaf, the petals are very narrow and acuminate, as also are the lateral lobules of the lip; the terminal lobules of the lip are, moreover, longer than in this.

PLATE 13B.—*Oberonia caulescens*, Lindl. Two plants, *of natural size*. Fig. 1 a flower, *front view*, 2 anther, 3 pollinia; *all enlarged*.

16. OBERONIA FALCATA, King and Pantling in Journ. As. Soc., Bengal, LXIV, pt. 2, p. 329.

Caulescent, tufted. *Stems* 5 in. long, flexuose. *Leaves* falcate, ensiform, acute, 1 to 2·5 in. long and ·2 to ·25 in. broad. *Inflorescence* erect, nearly as long as the stem and much longer than the leaves; the *peduncle* very short, terete, less than half as long as the uppermost leaf, bracteate; *raceme* many-flowered; *floral bract* equalling and sheathing the stalked ovary, ovate, sub-acute, erose. *Flowers* yellowish-green, minute (·05 in. long), crowded, sub-verticellate. *Sepals* ovate, entire, reflexed or spreading. *Petals* linear-oblong, blunt, entire. *Lip* twice as long as the sepals, broadly oblong in general outline, flat except for a slight depression near its base and just under the column; side lobes small, triangular, pointing outwards; the terminal lobe with two deep lanceolate slightly diverging terminal lobules separated by a wide sinus with a narrow but rounded edentate apex. *Column* with two fleshy wings. *Anther-cap* membranous. *Pollinia* ovate, compressed, and of a dark orange colour.

Choongthang in the Sikkim-Himalaya, at an elevation of 6,000 feet; Pantling No. 218; in flower during August.

This resembles *O. longilabris*, King and Pantling in having a winged column. But it is a larger plant than that, and its lip is differently lobed; the petals also are broader and their apices are not truncate as in that species. This also resembles *O. Mannii*, Hook. fil. (Ic. Plantar., t. 2003), but has narrower petals which are quite entire.

PLATE 14.—*Oberonia falcata*, King and Pantling. Two plants, *of natural size*. Fig. 1 front view of a flower, 2 floral bract, flattened out, 3 pollinia; *all enlarged*.

17. OBERONIA RUFILABRIS, Lindl. Sert. Orchid. t. 8A.

Stem very short. *Leaves* narrowly oblong, sub-ensiform, flaccid, ·75 to 5 in. long and ·25 to ·65 in. broad. *Inflorescence* erect, longer than the leaves; its *peduncle* short, bearing numerous soft filiform bracts; the *raceme* many times longer than the petiole, with very numerous flowers in whorls. *Flowers* ·05 in. in diam., reddish-brown; the bracts of the flowers in the lower part of the raceme ovate with long filiform tips much longer than the stalked ovaries, those of the upper part with much shorter tips and not longer than the ovaries, the margins of all entire. *Sepals* ovate, acute, concave, spreading. *Petals* linear-oblong, sub-acute, entire, spreading. *Lip* fleshy, twice as long as the sepals and petals, and of a darker colour than the rest of the flower, narrow, the whole of its upper surface scaberulous, a minute elongate pit at the base just under the column; basal lobes filiform, much curved upwards and backwards; terminal lobe narrow, deeply cleft into two lanceolate parallel lobules separated by a deep sinus with a blunt apex. *Clinandrium* deeply and unequally toothed; lip of *anther* cuspidate. Fol. Orchid., Oberonia 5; Hook. fil. Fl. Br. Ind. V, 683. *Malaxis rufilabris*, Reichb. fil. in Walp. Ann. VI, 213.

At the base of the Sikkim-Himalaya; Haines, Pantling No. 430. Burma; Berkeley, Kurz, No. 3278?; at Moulmein, Griffith.

PLATE 15.—*Oberonia rufilabris*, Lindl. Two plants, *of natural size.* Fig. 1 a flower seen from the front, 2 clinandrium and part of column, 3 floral bract from the lower part of a raceme, 4 floral bract from the upper part of a raceme, 5 cap of anther, 6 pollinia; *all enlarged.*

18. OBERONIA LONGILABRIS, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, p. 330.

Caulescent. *Stems* tufted, slender, 2 to 3 in. long. *Leaves* linear-ensiform, acute, ·75 to 1·5 in. long and ·2 in. broad. *Inflorescence* three times as long as the leaves, much decurved; the *peduncle* about as long as the uppermost leaf, terete, slender, ebracteate; the *raceme* tapering to the apex; *floral bract* lanceolate, acuminate, slightly erose, much exceeding the stalked ovary and about as long as the lip. *Flowers* yellow, minute (·06 in. long), scattered. *Sepals* ovate, entire. *Petals* linear-oblong, sub-truncate, entire, spreading like the sepals. *Lip* oblong in general outline, three times as long as the sepals, with two small rounded auricle-like lobes at the very base; the apical lobes broadly lanceolate, sub-divergent, acute, separated by a sub-triangular sinus; the middle part of the lip (mesochile) with a lanceolate depression extending from near the column to near the apical sinus. *Column* with small stout wings. *Pollinia* orange.

Sikkim; at Song-chong-loo, elevation about 6,000 feet: at Namgah, elevation about 5,000 feet; Pantling No. 227; in flower in July.

The concavity on the lip is deep just under the column, becoming shallower towards its apex. The winged column is very unusual in the genus. This species approaches *O. caulescens*, Lindl.; but differs in its longer stem, ebracteate peduncle, in its flowers not being in the least whorled, and in having truncate petals and a lip with shorter lobes.

PLATE 13A.—*Oberonia longilabris*, King and Pantling. Two plants, *of natural size*. Fig. 1 front view of a flower, 2 anther, 3 pollinia; *all enlarged.*

19. OBERONIA AURICULATA, *new species.*

Stem 1 to 1·5 in. long. *Leaves* linear-equitant, acuminate, not falcate, ·5 to 1 in. long and ·15 to ·2 in. broad. *Inflorescence* erect, three times as long as the leaves; *peduncle* less than one inch, naked or with a few bracts; *raceme* slender, sparsely-flowered; *floral bract* lanceolate, erose. *Sepals* ovate, sub-acute, the lateral pair reflexed on the slenderly stalked ovary. *Petals* erect like the dorsal sepal, narrowly oblong, blunt, the margins erose. *Lip* longer than the sepals and petals, oblong, narrowed at the truncate base, widening upwards, the apex divided into two obtuse diverging oblong lobules by a deep triangular sinus mucronate at its apex; lateral lobes none, but at each end of the base a small rounded auricle with a triangular depression inside it.

Sikkim; at Sureil and Rungbee at elevations of about 6,000 feet; Pantling No. 166; in flower in May.

Allied to *O. caulescens*, Lindl., but in that species the lip has rather large basal lobes, and the lobules of the terminal lobe are produced into tails; the petals, moreover, are entire, not erose as in this.

PLATE 16A.—*Oberonia auriculata*, King and Pantling. Two plants, *of natural size*. Fig. 1 a flower seen from the front, 2 anther, 3 pollinia; *all enlarged*.

20. OBERONIA PYRULIFERA, Lindl. Fol. Orchid., Oberonia, p. 3.

Stem very short. *Leaves* ensiform, obliquely acute or sub-acute, sub-falcate, 1 to 2·5 in. long and ·15 to ·30 in. broad. *Peduncle of inflorescence* slender, terete, about half as long as the leaves; the bracts slender, subulate; the *raceme* about the same length or longer, slender, decurved; *floral bract* shorter than the rather long-stalked ovary, lanceolate, acuminate, erose. *Flowers* minute (about ·065), green, scattered, not verticillate. *Sepals* ovate, acute, entire. *Petals* oblong, blunt, reflexed like the sepals and resting on the ovary. *Lip* more than twice as long as the sepals, oblong, with a quadrate hypochile truncate at the base, with a small rounded shoulder-like auricle at each extremity and a shallow triangular depression between; the apical lobe deeply cleft into two oblong sub-falcate obtuse divergent lobules with a large triangular sinus between them. *Capsules* ovoid-cylindric, ribbed, ·1 in. long. Hook. fil. Fl. Br. Ind. V, 678. *O. verticillata, var. Khasiana*, Lindl. Fol. Orchid., Oberonia, p. 3. *Malaxis verticillata, var. Khasiana*, and *M. pyrulifera*, Reichb. fil. in Walp. Ann. VI, 210, 211.

Valley of the Teesta in Sikkim, at an elevation of 1,000 feet; Pantling No. 191; in flower in October. Khasia Hills, elevation 4,000 to 6,000 feet; Hooker fil. and T.T. Munipore; Watt.

PLATE 16B.—*Oberonia pyrulifera*, Lindl. Two plants, *of natural size*. Fig. 1 a flower, seen from the front, 2 anther, 3 pollinia; *all enlarged*.

2. Microstylis, Nutt.

Terrestrial, sometimes epiphytic (two saprophytic), pseudo-bulbous. *Leaves* one or more, membranous, plicate, continuous with their sheaths (absent in two species). *Flowers* small, resupinate, in terminal racemes. *Sepals* spreading or recurved, sub-equal. *Petals* narrower than the sepals but of about the same length. *Lip* adnate to the base of the column, usually flat; the basal lobes large, sagittate, and produced upwards, or cup-shaped with small lobes, or without basal lobes; the apex emarginate, 2-3-lobed, erose or entire. *Column* very short (rather long in *M. congesta* and *M. Maximowiczziana*), with two short spreading arms. *Anther* sub-terminal, bilocular; *pollinia* 4, ovoid or obovoid.

A genus including about sixty species, of which ten are found in Sikkim and nine in other parts of British India and in Ceylon.

Lip slightly convex; the basal auricles sagittate, projecting upwards and more or less hiding the rest of the flower.

Leafy.

Anterior lobe of lip transversely elliptic, erose . . .	1. *M. Khasiana.*
Anterior lobe of lip rounded, notched; the basal auricles parallel, their tips not touching or overlapping . .	2. *M. Wallichii.*
Anterior lobe of lip sub-quadrate, deeply bifid; the basal lobes converging, their tips touching or overlapping .	2. *M. Wallichii, var. biloba.*
Anterior lobe of lip triangular, its apex notched . . .	3. *M. Scottii.*

Leafless and saprophytic or parasitic.
Plant 3 to 6 in. high, tuber orbicular; dorsal sepal reflexed and adpressed to the ovary; lip with a convex fold on its upper surface . . . . . 4. *M. saprophyta.*
Plant 7 to 9 in. high, tuber irregularly oblong; dorsal sepal erect; upper surface of lip smooth . . . . . 5. *M. aphylla.*
Lip fleshy, concave, with two transverse calli; its anterior part 3-lobed . . . . . 6. *M. congesta.*

Lip concave, entire, its apex produced into a beak; basal auricles absent.
Plant with a single leaf . . . . . 7. *M. cylindrostachya.*
Plant with two leaves . . . . . 8. *M. muscifera.*

Lip hooded or deeply cup-shaped; the basal lobes short, rounded.
Flowers numerous, only ·2 in. in diam. . . . . 9. *M. Maximowicziana.*
Flowers few, ·5 to ·75 in. in diam. . . . . 10. *M. Josephiana.*

1. Microstylis Khasiana, Hook. fil. Fl. Br. Ind. V, 686.

Stem about 3 in. high, growing close to the base of the cylindrical leafless pseudo-bulb of the previous year. *Leaves* three or four, ovate-elliptic, slightly oblique, 4- or 5-nerved, the apex acute or shortly acuminate, the base narrowed into the short sheathing petiole, the edges undulate; length 3 to 5 in., breadth 1 to 1·5 in. *Raceme* twice as long as the leaves; its peduncle ribbed, ebracteate. *Floral bract* lanceolate, reflexed, much shorter than the ovary. *Flowers* spreading, ·25 in. long. *Sepals* broadly ovate, concave, the dorsal narrower and sub-acute; the lateral broader, more obtuse and more concave. *Petals* linear, truncate. *Lip* broad, concave, with two basal and one apical lobe; the basal lobes falcate, acute, their apices converging and overlapping; the apical lobe separated from the two basal by a constriction, its outline transversely oblong, its apex broad, erose and somewhat incurved, or sometimes slightly bifid without being erose.

Sikkim-Himalaya; abundant between elevations of 3,000 and 6,000 feet; Pantling No. 283. Jaintia Hills, alt. 4,000 to 5,000 feet; Lobb, Rita, Mann; flowering from July to October.

The leaves of this beautiful species are of a lustrous greyish-green colour flushed with purple; the inflorescence with the pedicels and bracts of the flowers are of a dull purple, and the sepals and petals are purple, the lip being yellowish. There is a slight amount of variation in the terminal lobe of the lip. In some plants the lobe is almost truncate and erose, while in others it is somewhat rounded and minutely bifid; and between these there are intermediate stages. Exactly the same variation occurs in plants growing in the Jaintia Hills, as has been recently proved by the examination by Mr. Pantling of a large number of living plants kindly sent from these Hills by Mr. S. E. Rita, Assistant Commissioner there.

Plate 17.—*Microstylis Khasiana*, Hook. fil. A plant, *of natural size.* Fig. 1 flower, *front view*, 2 the same, *seen from the side*, 3 column, 4 vertical section of column and lip, 5 anther, 6 pollinia; *all enlarged.*

2. Microstylis Wallichii, Lindl. in Wall. Cat. No. 1938.

Stem about 3 in. long, with a few sheaths below. *Leaves* three or four, thinly membranous, ovate-lanceolate, acute or acuminate, narrowed to the sheathing base, the upper sessile, the lower with sheathing petioles 1·5 to 2·5 in. long; the edges much undulate; length 3 to 4·5 in., breadth 1·5 to 2 in. *Inflorescence* 9 to 12 in. long; the peduncle shorter than the raceme, ribbed; *raceme* laxly many-flowered; the *floral bracts* lanceolate, one-half of the length of the stalked ovaries. *Flowers* yellowish-green in colour, ·5 in. long. *Sepals* oblong, the dorsal narrower, sub-acute; the laterals broader, obtuse. *Petals* linear, blunt, the margins, like those of the sepals, recurved. *Lip* slightly convex, narrowly ovate in general outline; the basal lobes (or auricles) lanceolate, their inner edges straight and parallel to each other, separated by a space equal to about the width of the dorsal sepal. *Lip* not constricted so as to form a distinct anterior lobe; its apex flat or slightly incurved at the notch. *Column* with very fleshy rounded arms. Lindl. Gen. and Spec. Orchid., 20; Hook. fil. Fl. Br. Ind. V, 686; in Ann. Bot. Gard. Calc. V, pt. 1, t. 2, figures 1 and 2 (excl. syn., *M. biloba*). *Malaxis acuminata*, Don Prod. Flor. Nep. 29.

Himalaya from Simla to Sikkim, at elevations of from 5,000 to 7,000 feet; Pantling No. 448; flowering in Sikkim from June to September; also in the Khasia Hills and Ceylon; Thwaites C. P. No. 2375.

Of his catalogue No. 1938, Wallich issued two sets, one distinguished as 1 from Nepal, and the other distinguished as 2 from Sylhet (probably really from the Khasia Hills). The plant here figured agrees exactly as regards its lip with the sheet of Wall. Cat. 1938, 1 in the Calcutta Herbarium; but it differs from Sir Joseph Hooker's drawing (fig. C, Ann. Bot. Gard. Calc., V, pt. 1, plate 2), which represents the lip of the sheet bearing that number in the Kew Herbarium,—a circumstance which proves that (as in so many other cases) there has been some mixing amongst the Wallichian specimens. The picture of the plant itself, and both figs. A and B on plate 2 of the Calcutta Annals, are accepted by Sir Joseph Hooker as representatives of the true *M. Wallichii*, and these agree practically with the figure here given. And an examination of one hundred living specimens shows that there is no tangible variation in the lip worthy of record. The distinctions between this species and *M. biloba*, Lindl., are given in our account of the latter which we treat as a variety of this. *M. Wallichii* is abundant at elevations between 5,000 and 6,000 feet in the Government Cinchona Plantation in Sikkim; but it does not occur at lower elevations, its place being taken from about 5,000 feet downwards to the bottoms of the valleys by the variety *biloba*. The form of lip depicted by Sir Joseph Hooker in fig. C. of the plate in the Calcutta Annals above-quoted, represents the lip in the Kew specimen of 1938-1, and is no doubt, as Sir Joseph suggests, a form of *M. Wallichii*. In it the apex of the lip is obscurely 3-lobulate, and the basal lobes or auricles are divergent; the sepals also are unusually broad.

Plate No. 18.—*Microstylis Wallichii*, Lindl A plant, *of natural size*. Fig. 1 flower, *front view*, 2 flower, *back view*, 3 column and apex of ovary, 4 vertical section of the lip and column, 5 anther, 6 pollinia; *all enlarged*.

Var. *biloba*, Hook. fil. Fl. Br. Ind. V. 686; in Ann. Bot. Gard. Calc., Vol V, 2, t. 2, fig. D; basal lobes of lip slightly falcate, converging so that the apices either meet or overlap; apical portion of lip abruptly bent forward and forming an obovate-oblong or sub-quadrate apical lobe divided at the extremity into two rounded parallel oblong

blunt lobules; arms of the column only slightly fleshy; anther with a small sub-acute emarginate lip; leaves thicker in texture than in typical *M. Wallichii*, less acute and less undulate. *M. biloba*, Wall Cat. 1940; Lindl. Gen. and Spec. Orch. 20; Ridley in Journ. Linn. Soc. XXIV, 337.

In tropical Himalayan valleys at elevations below 5,000 feet. Pantling No. 37; flowering in Sikkim from July to September. Found also westwards along the Himalayan range to Nepal: also in the Khasia Hills.

Lindley considered this a species, and Wall. Cat. No. 1940 was issued under the name of *M. biloba*, Lindl. It was reduced by Sir Joseph Hooker, in his Flora of British India, to variety *biloba* of *M. Wallichii;* and the latter distinguished botanist, in an exhaustive note, illustrated by numerous figures of the lip, which he published in vol. V of the Annals of the Calcutta Garden, suggested that there are probably several species included under *M. Wallichii* as understood by him in the latter work. We feel satisfied, after the examination by Mr. Pantling of a hundred living plants each of *M. Wallichii* and of *M. biloba*, Lindl., that the latter ought to be kept up only as a distinct variety of the former. The chief differences between the type and the variety are to be found in the lip. In var. *biloba* the basal lobes of the lip are slightly falcate, and they are convergent, so that their apices either meet or overlap; the apical portion of the lip is abruptly bent forward (as is shown in fig. 2, plate 19), and forms an obovate-oblong or sub-quadrate apical lobe divided at its extremity into two rounded parallel oblong blunt lobules. In a hundred plants carefully examined by Mr. Pantling there was found to be practically no variation in these characters. Now in typical *M. Wallichii* the basal lobes of the lip are not at all falcate, their inner edges being quite straight. They therefore lie parallel to each other, the space between them being pretty wide; and their apices, which are acute, do not converge in the least. There is no constriction between the basal lobes and the anterior portion of the lip; in other words there is no distinctly marked apical lobe, the end of the lip is rounded and merely notched at the centre (it is never lobed), the notched part being slightly recurved. But there are other differences than those found in the lip. For example, the columnar arms in var. *biloba* are only slightly fleshy, and the anther has a small sub-acute emarginate lip; whereas, in *M. Wallichii* the arms of the column are very fleshy, and the lip of the anther is truncate. The leaves of the two also differ—those of var. *biloba* being of thicker texture with a rather less acute apex. Moreover the edges are only slightly and often not at all undulate; the leaves of *M. Wallichii*, on the other hand, are very undulate, the apex being acute or acuminate. Finally, the flowers of var. *biloba* vary from pale yellow to dull purple.

PLATE 19.—*Microstylis Wallichii*, Lindl., var. *biloba*. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 flower, *back view*, 3 column and apex of ovary, 4 vertical section of column and lip, 5 anther, 6 pollinia; *all enlarged*.

3. MICROSTYLIS SCOTTII, Hook. fil. Fl. Br. Ind. V, 687.

Stem about 2 in. high. *Leaves* two to five, sessile or with short convolute angled petioles, obliquely ovate-lanceolate, acute, the base narrowed, 5- to 7-nerved, the edges much undulate, almost crenate; length of blade 3 to 5 in., breadth 1·25 to 1·5 in. *Inflorescence* longer than the leaves; the peduncle ribbed and bearing a few scattered linear reflexed bracts. *Flowers* ·3 to ·4 in. long; the *floral bract* linear, reflexed, as

long as the shortly pedicelled ovary. *Dorsal sepal* narrowly oblong, sub-acute; the *lateral sepals* half as long, wider, blunt, all revolute. *Petals* linear, as long as the dorsal sepal. *Lip* triangular-ovate, the basal lobes obliquely lanceolate, converging, but the tips not meeting; the end (apical) lobe triangular, its apex acute and minutely emarginate. Hook. Ic. Plant. t. 2001.

Sikkim Himalaya; in the Teesta Valley, at elevations of 1,000 to 2,500 feet. Pantling No. 220; flowering from July to September. Burma, at Rangoon, J. Scott.

This charming species was dedicated by Sir J. D. Hooker to the late Mr. John Scott, for many years Curator of the Botanic Garden, Calcutta, and was originally described by its author from a specimen, brought from Rangoon by Mr. Scott, which flowered and was figured in the Calcutta Garden. The species has of late years been found in the Teesta Valley in Sikkim at elevations between 1,000 and 2,500 feet; and it is a Sikkim specimen which is here figured. A comparison of the present figure with that of the Burmese plant given by Sir Joseph, in his Icones Plantarum, t. 2001, shows that the Burmese plant has rather a different lip, being on the whole broader, with more obtuse basal lobes which are much less distinctly separated from the apical lobe; the apical lobe itself is, moreover, rather more deeply emarginate. In all other respects the Sikkim and Burmese plants agree. The leaves of this species are beautifully coloured, being dark-green and purple, with a pale border suffused with purple and dotted with green. The inflorescence, bracts, sepals and petals are also purple, the lip being greenish-yellow. (Since the foregoing was written, we learn from Sir Joseph Hooker that this species is identical with *M. calophylla*, Reichb. fil. in Gard. Chron. 1879, II, 718.)

Plate 20.—*Microstylis Scottii*, Hook. fil. A plant, *of natural size.* Fig. 1 a flower, *front view*, 2 the same, *back view*; 3 column, 4 anther, 5 pollinia; *all enlarged.*

4. Microstylis saprophyta, King and Pantling in Journ. As. Soc. Beng. Vol. LXV (1896), pt. 2, 118.

Terrestrial, leafless, saprophytic; the whole plant 3 to 6 in. high, glabrous. *Stem* tuberous at the base, with a few short crowded sheaths just above the bulb and two or three scattered lanceolate bracts ·35 in. long. *Raceme* 1 to 2 in. long, lax; *floral bract* lanceolate, equalling or exceeding the sub-sessile ovary. *Flowers* ·12 in. long, inverted. *Sepals* ovate, blunt. *Petals* linear; the dorsal sepal reflexed and adpressed to the ovary, the lateral sepals and the petals revolute. *Lip* rotund-reniform, entire, with a semi-lunar convex fold in the middle of the upper surface; the basal auricles erect, rather short and broad, sub-acute.

Sikkim-Himalaya, at Choongthang, elevation 6,000 feet; also in the Lachen valley; Pantling, No. 394.

The flowers, which are greenish, open about July.

A singular plant, quite unlike any other species in the genus except the next. The bulb at the base of the stem is about ·35 in. in diameter.

Plate 21.—*Microstylis saprophyta*, King and Pantling. Three entire plants, *of natural size.* Fig. 1 flower, *front view*, 2 flower, *in profile*, 3 flower, *seen from behind*, 4 anther, 5 pollinia; *all enlarged.*

5. Microstylis aphylla, *new species.*

Terrestrial, leafless, parasitic on roots, the whole plant 7 to 9 inches high. *Tuber* at the base of the stem irregularly oblong, sub-horizontal, smooth, ·75 in. long. *Stem*

ribbed, clothed at the base with three or four short membranous sheaths ·25 to ·5 in. long, and further up with two or three herbaceous pale-green tubular sheaths 1 in. long. *Raceme* longer than the peduncle; *floral bract* lanceolate, as long as the stalked ovary, deflexed to the rachis, the bracts of the lowest flowers longest. *Flowers* ·15 in. long, yellowish, flushed with dull purple. *Sepals* elliptic, sub-obtuse; the dorsal erect, its margins revolute; the lateral pair recurved, the linear *petals* resting upon them. *Lip* almost flat, ovate, the apex blunt, the margins entire, the base with two broad blunt sub-falcate erect lobes. Arms of the *column* stout, notched. Lip of the *anther* truncate.

Sikkim; in the valley of the Teesta, elevation 1,000 feet; Pantling No. 455; flowering in June.

The nearest ally of this is *M. saprophyta*, but this is in every way a larger plant; the tuber is elongated, not orbicular, the dorsal sepal is erect, not reflexed and not adpressed to the ovary; the lip in this is more pointed than in *M. saprophyta*, and it has no convex fold on its upper surface as in that species.

PLATE 22.—*Microstylis aphylla*, King and Pantling. Two plants, *of natural size*. Fig. 1 flower, *front view*, 2 flower, *side view*, showing also ovary and floral bract, 3 empty anther, 4 pollinia; *all enlarged*.

6. MICROSTYLIS CONGESTA, Reichb. fil. in Walp. Ann. VI, 206.

Stem 4 to 10 in. long, thickened near the base, tufted. *Leaves* three to six, elliptic-lanceolate, oblique, acute or acuminate, the base narrowed and sheathing, sessile or shortly petiolate, 7-nerved, the edges undulate; length of blade 3 to 12 in., breadth ·75 to 4·5 in. *Inflorescence* 6 to 14 in. long; the peduncle striate, with a few scattered subulate reflexed bracts ·5 in. long; *floral bract* lanceolate, acuminate, nearly as long as or exceeding the undulately-winged stalked ovary. *Flowers* ·25 in. long, resupinate, red or yellow, much crowded. *Sepals* oblong, sub-obtuse, the lateral pair falcate. *Petals* linear, obtuse. *Lip* rather fleshy, oblong, concave, scarcely exceeding the lateral sepals in length; its basal part without lobes; its anterior part 3-lobed, having two elongated, narrow, lateral lobes connected close to the column by a flat transverse callus, their free anterior extremities blunt; the apical lobe short, narrowly ovate, sub-acute. Ridley in Journ. Linn. Soc. XXIV, 334; Hook. fil. Fl. Br. Ind. V, 689. *M. Bernaysii*, F. Müll. Frag. Fl. Aust. XI, 21. *M. fusca*, Reichb. fil. in Walp. Ann. VI, 207. *M. trilobulata*, Kurz Andam. Rep. Append. B. XIX; N. E. Brown in Gard. Chron. 1883, 392. *? M. flavescens*, Lindl. Gen. and Spec. Orchid, 20; Ridley Journ. Linn. Soc. XXIV, 337. *Dienia congesta*, Lindl. in Wall. Cat. No. 1936; Gen. and Spec. Orchid, 22; in Bot. Reg. under t. 825; Reichb. fil. in Bonplandia, III, 259. *D. fusca*, Lindl. Gen. and Spec. Orchid, 22. *Malaxis latifolia*, Smith in Rees' Cyclop. *M. plicata*, Roxb. Fl. Ind. III, 456. *Crepidium flavescens*, Blume Bijdr., 388.

Tropical Himalaya from Nepal to Bhotan; in Sikkim from 600 up to 2,500 feet; Pantling No. 89. Parasnath; Khasia Hills; Munipore; Burma; the Andaman Islands; the Deccan and Ceylon. Also in Malaya, China and Australia.

This species has a very different lip from any other *Microstylis* described in the present work; the basal lobes, so prominent in the others, being in this entirely absent. There are moreover two transverse calli on the lip,—one at the base just beneath the

column, and the other connecting the two lateral lobes of the apex; whereas none of the other species have any calli on the lip. The flowers in the Sikkim specimens of this are all red or occasionally yellow; but, in other provinces, they vary to yellowish-green and purplish. The under-surfaces of the leaves and the rachis are in Sikkim suffused with purple.

PLATE 23.—*Microstylis congesta*, Reichb. fil. Inflorescence and leaf, *of natural size*. Fig. 1 a flower, *front view*, 2 stalked ovary, column and lip, *in profile*, 3 lip, 4 column and upper part of ovary, 5 anther, 6 pollinia; *all enlarged. In the corner is a much reduced figure of an entire plant.*

7. MICROSTYLIS CYLINDROSTACHYA, Reichb. fil. in Walp. Ann. VI, 297.

Stem proceeding from the base of the small conical tuber of a former year, 1·5 to 6 in. long to the base of the leaf, and bearing one or two tubular wide-mouthed sheaths. *Leaf* solitary, elliptic, sub-acute, passing at the base into the long tubular petiole; blade 1·5 to 4 in. long and ·75 to 1·75 in. broad. *Inflorescence* 3 to 10 in. long, the peduncle long, ebracteate, the raceme cylindric with numerous crowded small yellowish-green flowers about ·15 in. long. *Floral bract* lanceolate, shorter than the ovary. *Sepals* sub-equal, ovate, acuminate. *Petals* linear-lanceolate, acute. *Lip* fleshy, broadly ovate, excavated, the margins thickened, angled and denticulate at the base so as to appear lobed, the apex produced into a fleshy point; the upper surface having a raised line running along its centre from apex to base, and two convexities immediately under the column. *Pollinia* sub-obovoid, divergent, their points exserted over the corners of the stigma. Ridley in Journ Linn. Soc. XXIV, 333; Hook. fil. Fl. Br. Ind. V, 689. *Dienia cylindrostachya*, Lindl. in Wall. Cat. 1934; Gen. and Spec. Orchid, 22; Wight Ic. 1630.

Sikkim; the Lachen Valley, alt. about 12,000 feet; Pantling No. 379. Choombi (in Bhotan); King's Collector Nos. 409, 4709; flowering in July. Also in the North-West Himalaya from Simla to Nepal, but at slightly lower elevations.

PLATE 24.—*Microstylis cylindrostachya*, Reichb. fil. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 view in profile of bract, subsessile ovary, column and lip, 3 front view of column, the pollinia being absent, 4 an empty anther, 5 pollinia, 6 a pollen mass, *in profile; all enlarged.*

8. MICROSTYLIS MUSCIFERA, Ridley in Journ. Linn. Soc. XXIV, 333.

Stem from the apex of a small ovoid pseudo-bulb, 1 to 5 in. long, and bearing at least one tubular sheath. *Leaves* usually two, rather close together, unequal, ovate-rotund to ovate-lanceolate, sessile or petiolate, obtuse or sub-acute, somewhat narrowed at the base to the sheathing petiole; length of blade 1 to 2·5 in., breadth 1 to 1·5 in. *Inflorescence* 3 to 10 in. long; the peduncles terete, ebracteate; raceme rather lax. *Flowers* yellowish-green, ·15 in. long; *floral bract* shorter than or equal to the pedicelled ovary. *Sepals* sub-equal, broadly oblong-lanceolate, sub-acute, longer than the linear petals. *Lip* broadly ovate, fleshy and excavated at the base, the basal part with obscure thickened convex side-lobes. *Column* very short, fleshy. Hook. fil. Fl. Br. Ind. V, 689. *Dienia muscifera*, Lindl. in Wall. Cat. 1935; Gen. and Spec. Orchid, 23.

In the Lachen Valley in Sikkim; Pantling No. 395, common. Temperate Himalaya, alt. 8 000 to 11,000 feet, eastwards to Kashmir.

PLATE 25.—*Microstylis muscifera*, Ridley. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 bract, stalked ovary, column and lip, *in profile*, 3 lip, 4 an empty anther, 5 pollinia; *all enlarged*.

9. MICROSTYLIS MAXIMOWICZIANA, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV (1895), pt. 2, 330.

Rhizome 2 to 4 in. long, sub-erect, bearing scattered root-fibres and leafy pseudo-bulbs of varying ages 3 or 4 in. long. *Leaves* four or five, elliptic to elliptic-lanceolate, acute, tapering to the sheathing base, slightly oblique, 7-nerved, 5 to 6 in. long. *Raceme* about 6 in. long with numerous green flowers nearly ·2 in. in diam., the peduncle of the raceme 4 to 5 in. long. *Floral bract* linear-lanceolate, equal to or exceeding the stalked ovary. *Sepals* oblong, blunt, their margins recurved, the lateral pair broader than the dorsal. *Petals* linear, blunt, all reflexed. *Lip* concave, hood-shaped; its apex contracted, thickened, slightly crenate, and with two minute teeth above the pit; the side lobes large, sub-falcate, blunt. *Columnar arms* broad, overlapping and hiding the anther; the stigma large. Lip of *anther* truncate.

Sikkim; on the Mungpoo Cinchona Plantation, alt. 2,000 to 4,000 feet; Pantling No. 226; flowering in July; King, Gamble. Jaintia Hills; Mr. Rita.

The lip of this, although the flowers are in other respects very different, resembles that of *M. Josephiana* in being so very concave as to resemble a hood. In this respect these two differ from the other species of *Microstylis* here described. The column in this species also is larger than is usual in the genus, and has broad arms which overlap and hide the anther,—an arrangement the meaning of which is that the flowers are self-fertilized. If a fresh inflorescence be examined it will be found that in every newly-opened flower the pollinia have their points slightly exserted above the stigma. If an older flower be examined from further down the raceme, the membranous floor of the clinandrium will be found to have been absorbed by the stigma. A still older flower taken from near the base of the raceme will show the pollinia in contact with the stigma with their grains germinating in its tissues; while at the very base of the raceme young capsules may be found. All these stages may easily be found on the same raceme, as the flowers persist for a long time. These observations, originally made on growing plants by Mr. Pantling in 1892, have since been confirmed. The curious habit of this species is no doubt accounted for by the fact that it grows amongst long grass and other herbs more powerful than itself, to contend with which, in the struggle for light and air, the peculiar semi-erect long rhizome has been developed. Mr. Pantling has recently found that an exactly similar habit is assumed by plants of *M. Khasiana*, and also of *M. Wallichii* and its variety *biloba*, when they grow amongst longer grass than usual.

PLATE 26.—*Microstylis Maximowicziana*, King and Pantling. Rhizome with pseudo-bulb of past and present years and inflorescence, *of natural size*. Fig. 1 flower, *front view*, 2 flower, *in profile*, 3 longitudinal section of lip, 4 column and upper part of ovary, 5 anther, 6 pollinia; *all enlarged*.

10. MICROSTYLIS JOSEPHIANA, Reichb. fil. in Bot. Mag. t. 6325.

Stem about 2 in. long, with several oblong acute sheaths, rising from the base of a fusiform compressed pseudo-bulb 2·5 to 3 in. long, covered with broad acuminate sheaths.

Leaves three to five, oblong or elliptic-lanceolate, plaited, acuminate, sheathing at the base, subsessile, slightly oblique, the edges undulate, often tinged with purplish-brown above, green beneath, 3·5 to 5 in. long, 1·5 to 2 in. broad. *Inflorescence* 8 to 10 in. long; the peduncle longer than the raceme, ebracteate, acutely 6-angled; *raceme* 6- to 12-flowered, lax; *floral bract* lanceolate, much shorter than the angled ovary, reflexed. *Flowers* large for the genus, ochraceous, much shaded with brown or yellow, with red blotches near the column, ·5 to ·75 in. in diam. *Sepals* broadly ovate, recurved, connate by their bases, the dorsal saccate at the base. *Petals* linear-oblong, acute, recurved. *Lip* ventricose, gibbous, forming a deep cup with short broad rounded overlapping basal auricles; the part immediately under the column divided into a four-chambered nectary, the apex bifid. *Column* very stout and with thick arms. Ridley in Journ. Linn. Soc. XXIV, 336; Hook. fil. Fl. Br. Ind. V, 687.

Sikkim-Himalaya, at 1,500 to 3,000 feet; Pantling No. 312; Clarke, King, Gammie, Anderson and others.

A species with flowers unlike those of any other Sikkim *Microstylis*, and with the facies of those of *Eulophia*. The flowers are short-lived and they open only two or three at a time.

Plate 27.—*Microstylis Josephiana*, Reichb. fil. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 column with section through the 4-chambered nectary, 3 anther, 4 pollinia; *all enlarged*.

3. **Liparis**, Richard.

Terrestrial or epiphytal, pseudo-bulbous. *Leaves* one or more, membranous or coriaceous, continuous with the sheath, or thickened and jointed at the base. *Flowers* small, in terminal racemes, resupinate or not. *Sepals* spreading or recurved, the margins usually revolute. *Petals* much narrower than the sepals. *Lip* adnate to the base of the column, usually broad, flat, or deflexed from the middle, sometimes concave, often with calli near the base. *Column* elongate, often arched, usually winged near the apex, and tumid or dilated and compressed at the base. *Anther* terminal; *pollinia* 4.

A genus of about 100 species; inhabitants of both temperate and tropical regions; numerous in British India—chiefly on the lower slopes of the various mountain ranges.

In many species the pseudo-bulb is cylindric, and in such it is usually described as *stem*. In many also the young leaves and inflorescence are produced on a new growth rising from the base of the pseudo-bulb formed during the previous year; the new growth itself, after flowering and shedding its leaves, becoming the pseudo-bulb of next year. This is the case in all the Indian members of the section *Mollifoliæ*. In other species both leaves and inflorescence are produced at the apex of previously formed pseudo-bulbs. The latter, as well as the arrangement first described, obtains in the group *Coriifoliæ*.

Sect. I.—Mollifoliæ.—Leaves membranous, large, contracted at the base into and continuous with a long sheath.

* Lip abruptly deflexed from the very base, flat.

Leaf solitary.

Lip more or less deltoid, its apex very broad . . . . . 1. *L. cordifolia.*

Lip more or less broadly elliptic or ovate, narrowed to the apex . . . 2. *L. Gamblei.*

Leaves two.
Lip more or less quadrate, obovate or orbicular, its apex broad.
Floral bracts broad, minute, erect . . . . . 3. *L. Cathcartii.*
Floral bracts narrow, lanceolate, deflexed . . . . . 4. *L. deflexa.*
Lip elliptic, its apex acute . . . . . 5. *L. Nepalensis.*

** Lip deflexed from about the middle, concave.
Leaf one; the lip ciliolate on the margin and narrowed to the mucronate apex . . . . . 6. *L. Glossula.*
Leaves two; margin of the lip erose, not ciliolate; its apex broad, deeply emarginate, mucronate in the middle . . . . . 7. *L. paradoxa.*
Leaves four or five . . . . . 8. *L. bituberculata.*

SECT. II.—CORIIFOLIÆ.—Leaves coriaceous or sub-coriaceous, jointed to the sheath or pseudo-bulb.

* Lip much deflexed from about the middle.
Pseudo-bulb elongated, often cylindric and stem-like, leaves two.
Wings of column small, short.
Lip sub-orbicular with minutely erose-dentate edges, contracted near the base into a short claw . . . . . 9. *L. plantaginea.*

Lip-broadly oblong, the basal part thickened into two triangular processes, the apex broad, mucronate—
Leaves 4 to 6 in. long . . . . . 10. *L. longipes.*
Leaves 8 to 14 in. long . . . . . 10. „ „ var. *spathulata.*
Lip quadrate-oblong, the apex emarginate and minutely erose . 11. *L. bistriata.*
Wings of column elongated, hook-like . . . . . 12. *L. Cootanensis.*

Pseudo-bulb short, ovoid, not stem-like.
Leaf solitary.
Column not winged at the apex and not thickened at the base, or very slightly so; the lip without calli at its base.
Apical lobe of lip rhomboid, acute, the edges erose . . 13. *L. Mannii.*

Apical lobe of lip quadrate.
Lip without basal calli . . . . . 14. *L. pusilla.*
Lip with two small basal calli . . . . . 15. *L. Duthiei.*

Leaves two or sometimes more.
Column winged at the apex and dilated at the base; lip with two long horizontal diverging callosities near its base . . . 16. *L. perpusilla.*
Column not winged at the apex and very slightly dilated at the base; rostellum single; lip with a small entire callus at the base . . . . . 17. *L. Griffithii.*
Column shortly winged at the apex and much dilated and flattened at the base; rostellum double; lip with a large bilobed callus at its base. . . . . 18. *L. pygmaea.*
Column with small triangular wings near the apex, the base much dilated and flattened; rostellum single; basal half of the lip with four calli . . . . . 19. *L. platyrachis.*
Column with large broad wings about the middle, the base not dilated; the lip orbicular-oblong, hispidulous, its base plicate. 20. *L. delicatula.*

** Lip deflexed from near the base.

Leaves two, pseudo-bulbs disciform, column not winged . . . . . *21. L. viridiflora.*

Leaves two to four, pseudo-bulbs ovoid-oblong, compressed, column winged. . . . . .

Wings of column short, broad, not hooked, lip with emarginate apiculate apex . . . . . *22. L. Assamica.*

Wings of column produced into long hooked processes; apex of lip entire . . . . . *23. L resupinata and var. Ridleyi.*

1. Liparis cordifolia, Hook. fil. Ic. Plantar., t. 1811.

Terrestrial; the whole plant of a uniform deep green colour. *Pseudobulbs* crowded, much compressed, ovoid, pointed, having some scattered fibres at the base, 1·5 in. long. *Stem* short, stout, enveloped by the leaf-sheath. *Leaf* large, solitary, broadly ovate, acute; the base broad, cordate, suddenly contracted into the wide sheath, shining, the nerves few and indistinct, 2 to 5 in. long and 1·5 to 4 in. broad. *Inflorescence* about as long as the leaf; the peduncle elongate, ebracteate; the *raceme* only 1 to 2 in. long; *floral bract* triangular, minute, the pedicelled ovary long and filiform. *Flower* ·65 in. long. *Sepals* linear-lanceolate, acute; the dorsal spreading, the lateral pair lying under the lip and concealed by it except their apices. *Petals* linear, spreading. *Lip* broadly triangular or obovate-deltoid, flat, with a slight concavity at the base, and with a minute tooth on each side, a central grooved ridge, and two lateral branching nerves; the edges minutely erose-crenulate; the apex broad, subtruncate and apiculate. *Column* curved, much swollen at the base, and produced into two polished knobs, the apex with two short rounded wings. *Pollinia* elongate, 3-angled, each pair resting on a distinct rostellum which is tipped with a ball of transparent viscus. Hook. fil. Fl. Br. Ind. V, 692.

Sikkim-Himalaya; elevation 5,000 to 6,000 feet; Pantling No. 134. North-west Himalaya. Khasia Hills; 3,000 to 6,000 feet; Griffith, Hooker and Thomson. In flower during October and November.

Plate 28.—*Liparis cordifolia*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 bract, stalked ovary, lateral sepals, lip, and column, *in profile*, 3 base of lip, 4 column, 5 pollinia, 6 lateral view of pollen mass; *all enlarged*.

2. Liparis Gamblei, Hook. fil. Ic. Plantar. t. 1812.

Epiphytal. *Pseudobulbs* in clusters, sub-orbicular, flattened, green, smooth. *Leaf* solitary, with a long wide sheath embracing the future pseudo-bulb and the base of the peduncle, elliptic or elliptic-oblong, 7-nerved, the margins minutely undulate nearly to the apex, narrowed at the base to the long sheath, length 1 to 4 in., and breadth ·5 to 2 in. *Inflorescence* longer than the leaf; the peduncle rather stout, angled when dry; *raceme* rather laxly-flowered; the *floral bract* lanceolate, acute, shorter than the pedicelled ovary. *Flowers* ·25 in. long. *Sepals* oblong-lanceolate, the dorsal reflexed from about the middle, the lateral pair adpressed to the under surface of the lip. *Petals* linear, deflexed, their margins revolute. *Lip* deflexed from the base, broadly elliptic, longer than the lateral sepals, obtuse or sub-acute, green with brownish edges; its surface and edges minutely papillose and with three strong branching brownish-purple

median nerves; the base with a small cavity bearing on its margins two minute calli under the column. *Column* rather stout, strongly curved about the middle, thickened at the base, the apex with two broad wings; *pollinia* obovoid; rostella two. Hook. fil. Fl. Br. Ind. V, 693; in Ann. Bot. Gard. Calc. Vol. V, pt. 1, 2 t. 3.

Sikkim-Himalaya at Rungbee, Clarke; on Sinchal, alt. 6,500 feet, Gamble; above Sureil, alt. 6,000 feet, Pantling, No. 150; in flower in June.

An exquisite little plant found growing on the moss-covered trunks of trees in cool damp forests. The flowers are of a dark-green, the lip having a broad margin of brownish-purple and many nerves of the same colour.

PLATE 29.—*Liparis Gamblei*, Hook. fil. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 flower, *seen from the side*, 3 column and apex of ovary, 4 anther, 5 pollinia; *all enlarged*.

3. LIPARIS CATHCARTII, Hook. fil. Ic. Plantar. t. 1808.

Terrestrial. *Pseudo-bulb* narrowly ovoid, about 1·25 in. long. *Stem* from the base of the pseudo-bulb, decumbent below, erect above, 2 or 3 in. long, bearing several sub-acute sheaths and at the apex two sub-opposite, broadly-ovate or elliptic-ovate sub-acute leaves, contracted into sheathing petioles at the more or less cordate bases; length of blade 1·5 to 4 in.; breadth 1 to 2 in.; petioles 1 to 2·5 in. long. *Inflorescence* much longer than the leaves, winged; the peduncle striate, ebracteate; *raceme* laxly-flowered; *floral bract* minute, broad, erect. *Flower* from ·8 to ·9 in. long, green and purple. *Sepals* oblong, blunt, their edges much recurved, spreading, the lateral pair closely adpressed to the lower surface of the lip. *Petals* linear, curved and reflexed. *Lip* flat, obovate, with a clawed cordate base and a truncate erose apex cuspidate in the middle; the base with two obscure calli connected by a thickened line so as to form a nectary, with a groove proceeding from it and disappearing about half-way up the middle of the lip. *Column* long, slender, curved, the apex sub-truncate and with two short broad wings; the base slightly thickened and with two teeth. *Anther* sub-quadrate; *pollinia* clavate-obovoid. Hook. fil. Fl. Br. Ind. V, 694. *L. rupestris (in part)* Ridley in Journ. Linn. Soc. XXII, 145 *(not of Griffith)*.

The flowers in this species are most beautifully and delicately coloured; the sepals, petals and upper part of the column with the anther are green; the base of the column is purple, as is also the greater part of the lip, the latter having besides veins of a deeper shade of the same colour, while its anterior edge has a broad margin of yellowish green.

Sikkim; in the Lachen valley, at an elevation of 7,000 feet; Pantling No. 369; at elevations of 8,000 to 10,000 feet; Hooker, Clarke.

PLATE 30.—*Liparis Cathcartii*, Hook. fil. A plant, *of unusually large size*. Fig. 1 a flower, *seen from the front*, 2 flower, *seen from behind*, 3 column, 4 anther, 5 pollinia; *all enlarged*.

4. LIPARIS DEFLEXA, Hook. fil. Fl. Br. Ind. V, 697.

Terrestrial. *Stem* cylindric, as thick as a goose-quill, about 2 or 2·5 in. long, covered by two or three tight short sub-acute sheaths, springing from a cylindric root-bearing tuber which has beside it a more succulent rootless tuber. *Leaves* two from near the top of the stem, sub-opposite, and with short unequal petioles, elliptic, tapering from the middle to the acuminate apex and to the sheathing base, membranous, plicate,

7-nerved; length 6 or 7 in., breadth 2·25 to 2·5 in. *Inflorescence* longer than the leaves, erect, striate; the peduncle with a few lanceolate reflexed bracts; *raceme* laxly-flowered; *floral bract* half as long as the pedicelled ovary, reflexed. *Flowers* ·35 in. long, yellow. *Sepals* narrowly oblong, the dorsal one acute, the lateral pair obtuse. *Petals* narrowly oblong, obtuse, and, like the sepals, reflexed and with recurved margins. *Lip* flat, orbicular-reniform, contracted at its junction with the column, the margins near the base quite entire, at the sides and apex minutely erose; the apex very broad, slightly emarginate and mucronate; the upper surface with a narrowly oblong mesial glistening and nectar-exuding patch extending from the base to the middle; calli two just under the column. *Column* slightly curved, with narrow rounded wings near the apex; the base somewhat swollen. Hook. fil. Ic. Plantar. t. 2008.

Sikkim-Himalaya; at Goke, elevation 2,000 feet; Pantling No. 336; flowering in August. At Darjeeling; Griffith's collectors.

PLATE 31.—*Liparis deflexa*, Lindl. A plant, *of natural size*. Fig. 1 a flower seen from the front, 2 flower, *back view*, 3 column, 4 anther, 5 pollinia; *all enlarged*.

5. LIPARIS NEPALENSIS, Lindl. in Wall. Cat., 1945.

Terrestrial. *Rhizome* elongate, stout, bearing rather distant ovate-acuminate compressed striate green pseudo-bulbs about 2 in. long; the stem terminating the rhizome, stout, short. *Leaves* two, shining, broadly ovate to sub-orbicular, abruptly acute or shortly acuminate, the bases rounded or cordate, suddenly contracted into the long stout sheath-like petiole, the upper one amplexicaul and sometimes (fide Hooker) sessile, midrib distinct; lateral nerves about five pairs, curved, ascending. *Inflorescence* 4 to 10 in. long; the peduncle stout, ebracteate; *raceme* sparsely flowered; *floral bract* about ·5 in. long, equalling the stalked filiform ovary. *Flowers* ·5 in. long. *Sepals* lanceolate-acuminate, the edges revolute, the dorsal one reflexed, the lateral pair lying parallel under the lip. *Petals* linear, spreading. *Lip* flat, elliptic, slightly cordate at the base, narrowed to the apex, with a stout smooth central ridge ending in a mucronate point and with numerous spreading branching purple veins; the edges entire, not undulate; the base with two calli separated by a small depression. *Column* arched, its base thickened, grooved, and with two purple spots just above its junction with the lip; wing short, rectangular; rostella two, pollinia obovoid. Lindl. Bot. Reg. sub t. 882; Lindl. Gen. and Spec. Orchid., 28; Ridley in Journ. Linn. Soc. XXII, 278; Hook. fil. Fl. Br. Ind. V, 693. *Malaxis cordifolia*, Smith in Rees' Cyclop. *Acianthus petiolatus*, Don Prodr. Fl. Nep., 29.

Sikkim-Himalaya; common at elevations of from 3,500 to 5,000 feet; Pantling No. 217. Nepal; Wallich. Khasia Hills; Griffith and others; in flower in May.

The lip and petals of this species are purple, the other parts of the flower being green.

PLATE 32.—*Liparis Nepalensis*, Lindl. A plant, *of natural size*. Fig. 1 flower, *in profile*, 2 lip, 3 column, 4 pollinia: *all enlarged*.

6. LIPARIS GLOSSULA, Reichb. fil. in Linnæa, XLI, 43.

Terrestrial. *Pseudo-bulbs* ovoid, tufted, 1·5 to 2 in. long. *Leaf* solitary, oblong, sub-acute, suddenly contracted into a sheath at the base, sometimes petiolate, 2 to

4 in. long and ·65 to nearly 1 in. broad. *Inflorescence* erect, longer than the leaf, slightly winged, *raceme* laxly-flowered; *floral bract* linear, obtuse, shorter than the pedicelled ovary. *Flower* ·75 in. long, green, the lip purple. *Sepals* oblong-lanceolate, acute, the dorsal spreading, the lateral pair lying parallel under the lip, all with revolute margins. *Petals* linear, reflexed. *Lip* oblong, deflexed about the middle, concave and with a shining fluted line running from base to apex; the basal or non-deflexed part without calli, the deflexed or anterior part with a broad rounded ciliolate cuspidate apex, the whole lip veined and purple, the edges olive green. *Column* with two short wings near the apex, the base dilated into two large purple knob-like convexities. *Anther* with a beaked apex. *Pollinia* obovoid. Ridley in Journ. Linn. Soc. XXII, 268; Hook. fil. Ic. Plantar., t. 1809; Fl. Br. Ind. V, 693.

In the Chumbi valley, north-east of Sikkim; elevation about 11,000 feet; Pantling No. 402. Westwards along the Himalaya to Kumaon and Gharwal.

PLATE 33.—*Liparis Glossula*, Reichb. fil. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 floral bract, pedicelled ovary, column and lip, *side view*, 3 column with pollinia *in situ*, 4 empty anther, 5 pollinia; *all enlarged*.

7. LIPARIS PARADOXA, Reichb. fil. in Walp. Ann. VI, 218.

Terrestrial. *Pseudo-bulbs* narrowly ovoid. *Stems* tall, as thick as a pencil, about 6 in. high, slightly bulbous at the base, bearing several sheaths. *Leaves* two or three, alternate, narrowly elliptic-lanceolate, acute, narrowed to the amplexicaul sheath, plicate, 5-nerved, 5 in. long and about 1 in. broad at the middle. *Inflorescence* longer than the leaves; the peduncle finely striate, with one or two linear spreading bracteoles ·25 in. long; *raceme* as long as, or longer than, its peduncle, few-flowered; *floral bract* ovate-lanceolate, shorter than the twisted stalked ovary. *Flowers* ·5 in. long, green, the lip dull purple. Dorsal *sepal* linear, blunt, spreading, its margins recurved; the lateral pair broadly ovate, 5-nerved, recurved. *Petals* linear, obtuse, reflexed, their margins recurved. *Lip* quadrate, abruptly deflexed from the middle, concave, and bearing two erect tooth-like calli; its edges entire; its apex broad, emarginate, erose, and with a short central apiculus. *Column* not curved, its upper half hood-like from the large rounded crenulate wings. *Anther* acuminate. Ridley in Journ. Linn. Soc. XXII, 261; Hook. fil. Fl. Br. Ind. V, 698. *L. odorata*, Lindl. Gen. and Spec. Orchid., 26; Thwaites' Enum. Pl. Ceyl., 295. *Empusa paradoxa*, Lindl. in Wall. Cat. 1937A (*in part*), Bot. Reg. sub., t. 825; Gen. and Spec. Orchid., 17; Miquel Prolus. Fl. Japon., 135; Thwaites' Enum. Pl. Ceyl., 426. *Malaxis lancifolia*, Smith in Rees' Encycl.

Tropical valleys up to elevations of 6,000 feet in the Sikkim-Himalaya; Pantling No. 228. Kamaon-Himalaya, Naga Hills, Khasia Hills. Near Mymensingh in Bengal. Burma, Mysore, the Concan and Ceylon—also in Siam, China, Japan and Java. Flowering in Sikkim from July to September.

The description and figure here given of this widely-distributed plant refer to it only as it is found in the Sikkim-Himalaya. The descriptions of specimens from other regions show that they differ in some respects.

PLATE 34.—*Liparis paradoxa*, Reichb. fil. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 a flower, *in profile*, 3 lower surface of lip, 4 anther, 5 pollinia; *all enlarged*.

8. Liparis bituberculata, Lindl. Bot. Register, sub 882.

Terrestrial. *Stems* tall, tufted, erect, robust, fleshy, from 8 to 10 in. high and ·75 in. in diameter near the base. *Leaves* four or five, membranous, polished, ovate to elliptic-lanceolate, oblique, plicate, shortly acuminate, the base tapering into the broad sheathing petiole, 7-nerved; length 4 to 8 in. *Inflorescence* stout, erect, striate, much longer than the leaves; the peduncle ebracteate; *raceme* about 6 in. long, rather few-flowered; *floral bract* cordate, acute, deflexed, minute. *Flowers* ·65 in. long, dull, brownish-purple (the column alone pale-green); the stalked ovary ·6 in. long. Dorsal *sepal* linear-oblong, obtuse, sigmoidly curved backwards, ·4 in. long, the lateral pair broader but of similar shape, spreading. *Petals* linear, spreading; their margins, like those of the dorsal sepal, recurved. *Lip* oblong, very concave, deflexed and revolute from about the middle, bearing two sharp tooth-like calli at its base; the edges entire or slightly crenulate, the apex blunt with a small triangular apiculus. *Column* very slightly winged near the apex, not swollen at the base, slightly curved towards the middle. Ridley in Journ. Linn. Soc. XXII, 263; Hook. fil. Fl. Br. Ind. V, 693; *Enpusa paradoxa*, Wall. Cat. 1937B; Lindl. Gen. and Spec. Orchid., 17. *Cymbidium? bituberculatum;* Hook. Exotic Flora, t. 116. *Sturmia bituberculata*, Reichb. fil. in Bonplandia, II, 22.

Sikkim-Himalaya at Choongthang, elevation 6,000 feet, and in Lachen Valley; Pantling No. 222; Griffith, Hooker and others. Kamaon, Blinkworth; and Nepal, Wallich. Flowering in Sikkim in June and July.

Distinguished by the small size of the floral bract. *L. macrocarpa*, Hook. fil., from Sikkim and Khasia, which the author describes as like a large state of *L. tuberculata*, ought, we think, to be reduced to this, as also might in all probability *L. odontostoma*, a species founded in Linnæa (vol. XLI, 97) by Reichenbach on a specimen collected in Sikkim by Sir Joseph Hooker. In his Flora of British India (V. 707), Sir Joseph Hooker treats the latter as a doubtful species. The two calli at the base of the lip, which gave origin to the specific names *odontostoma* and *bituberculata*, are not peculiar to this, but occur in other species of the genus. This species closely resembles the plant figured by Lindley in the Botanical Register (t. 1175) under the name *L. elata*, said to have been introduced to England from Rio Janeiro. In fact Lindley (Gen. and Spec. Orchid., 27) reduces the *Cymbidium? bituberculatum* of Hooker's Exotic Flora (t. 116) to his *Liparis elata*. But the note which follows Lindley's description indicates that there was a good deal of doubt as to the real native country of the plant said to have been received in the Royal Horticultural Society's Garden from Brazil. The probability appears to be that the so-called Brazilian *L. elata* really came from the Himalaya, and that it is conspecific with Hooker's *Cymbidium? bituberculatum*, and therefore = *Liparis bituberculata*. Plants of this species vary considerably in robustness and also in the size of the flowers. The one figured here belongs to the set with large flowers. Some plants recently received from the Khasia Hills are smaller and have smaller flowers, and these seem to be fair examples of the species as it grows in the Khasia Hills. The small form was collected once last year in Sikkim (at Sureil, elevation 5,500 feet), but it is uncommon in Sikkim.

Plate 35.—*Liparis bituberculata*, Lindl. A plant, *of natural size*. Fig. 1 a complete flower, *in profile*, 2 the lip viewed from behind the base, showing the two sharp basal calli, 3 column, 4 anther, 5 pollinia; *all enlarged*.

9. Liparis plantaginea, Lindl. Gen. and Spec. Orch. 29.

Epiphytal. *Pseudo-pulbs* large, narrowly ovoid-oblong, compressed, smooth, pale-green, 2 to 3 in. long and ·75 to 1·5 in. thick at the base. *Pseudo-stem* stout, short, composed of four or five large acute imbricate sheaths increasing in size upwards, and two leaves. The *leaves* sub-opposite, sessile or petiolate, linear-oblong or oblanceolate-oblong, acute, narrowed to the base, faintly 5- to 7-nerved, keeled, 6 to 12 in. long and 1 to 2 in. broad. *Inflorescence* 8 to 12 in. long, sub-erect or flexuose, about as long as the leaves; the peduncle about equal to the raceme, compressed and almost 2-winged, with one or two linear lanceolate bracts; *raceme* sparsely flowered, its rachis irregularly winged; *floral bract* ovate-lanceolate, convolute, not quite so long as the ovary. *Flowers* green, ·75 to 1 in. long. *Sepals* oblong-lanceolate, sub-acute, their edges revolute, the dorsal spreading, the lateral pair lying parallel under the lip. *Petals* linear, decurved, revolute. *Lip* large, slightly concave, sub-orbicular with minutely erose-dentate edges, decurved near the base and contracted into a shortly auriculate claw bearing a didymous callus. *Column* with thickened base and two very small angular wings. Ridley in Journ. Linn. Soc. XXII, 286; Hock. fil. Fl. Br. Ind. V, 702; in Ann. Bot. Gard., Calcutta. Vol. V, pt. 1, p. 3, t. 4. *L. selligera*, Reichb. fil. in Linnæa XLI, 42. *L. orbicularis*, Lodd. MSS. ex Hemsl. in Gard. Chronicle, New Series, XVI (1881), 592. *L. Griffithii* (in part), Ridley l. c., 285.

Sikkim-Himalaya, elevation 1,000 to 2,000 feet; Clarke, King, Pantling No. 153. Upper Assam; Griffith No. 5069. Naga Hills; Khasia Hills; flowering from June to August.

Plate 36.—*Liparis plantaginea*, Lindl. A plant, *of natural size*. Figs. 1 and 2 front and profile views of a flower, 3 column, 4 base of the lip showing the claw and the small auricles, 5 the anther, 6 pollinia; *all enlarged*.

10. Liparis longipes, Lindl. in Wall. Pl. As. Rar. I, 31, t. 35.

Epiphytal. *Pseudo-bulbs* close together in a row, cylindric and stem-like, with a few vertical striæ and tightly-clasping sheaths, 3 to 6 in. long. *Leaves* two, oblanceolate-oblong, sub-acute to acuminate, sometimes aristate, 4 to 6 in. long and ·75 in. broad. *Inflorescence* erect, slightly longer than the leaves; the peduncle slender, terete, ebracteate; the *raceme* twice as long as its peduncle, many-flowered; *floral bract* linear-lanceolate, shorter than the pedicelled ovary. *Flowers* ·25 in. long, pale yellowish-green. *Sepals* linear-oblong, sub-acute. *Petals* shorter than the sepals, linear, obtuse, reflexed and, like the sepals, with the edges recurved. *Lip* broadly-oblong, recurved from about the middle, the inner margins at the base much thickened so as to form triangular processes; true calli none, the sides entire, the apex broad with a small central apiculus. *Column* slightly curved, the wings very small, rounded. Wall. Cat. 1943, *in part*; Lindl. Gen. and Spec. Orchid., 40; Ridley in Journ. Linn. Soc. XXII, 293 (excl. syn. *L. elegans*, Lindl.); Hook. fil. Fl. Br. Ind. V, 703; Wight's Icones, t. 906; Thwaites' Enum. Pl. Ceyl., 295; Benth. Flora Hong-Kong, 352. *L. pendula*, Lindl. in Bot. Reg. 1838, Misc. 180. *?L. nesophila*, Reichb. fil. Ot. Hamb. I, 56.

Tropical Himalaya, from Kamaon to Bhotan, at elevations of 1,000 to 5,000 feet; commom in Sikkim at altitudes of 1,000 to 4,000 feet; Pantling No. 59. Khasia Hills and southwards to Perak and Penang: also in the Nilgiri Hills and in Ceylon; distributed also in China and in the Malayan and Pacific Islands; flowering in Sikkim from October to December.

Var. *spathulata*, Ridley. Leaves 8 to 14 in. long and about 1·25 to 1·5 in. broad; the pseudo-bulbs about 3 in. long and 1 inch in diam. at the base, quite covered by large loose ovate-lanceolate convolute sheaths. Scape sparsely bracteolate, the apex of the lip minutely 3-lobed. *L. spathulata*, Lindl. in Bot. Reg. 1842, Misc. No. 189, p. 81.

At Engo, elevation 3,000 feet, Pantling No. 302; in flower in October.

PLATE 37.—*Liparis longipes*, Lindl. A plant, *of natural size*. Fig. 1 a flower, *in profile*, 2 lip *viewed from the base*, 3 upper part of column, 4 anther, 5 pollinia, 6 one of the pollinia *in profile; all enlarged*.

PLATE 38.—*Liparis longipes*, Lindl., var. *spathulata*. A plant, *of natural size*. Fig. 1 a flower, *in profile*, 2 the lip, 3 column, 4 anther, 5 pollinia; *all enlarged*.

11. LIPARIS BISTRIATA, Parish and Reichb. fil. in Trans. Linn. Soc. XXX, 155.

Epiphytal. *Pseudo-bulbs* elongated and stem-like, 3 to 6 in. long, tufted. *Leaves* two, sub-coriaceous, elliptic-lanceolate or elliptic-oblong, acute or sub-acute, narrowed to the base, sessile or sub-sessile, 2 to 4 in. long and about ·5 in. broad. *Inflorescence* longer than the stem, erect; the peduncle short, rather stout, margined or winged, ebracteate; *raceme* much longer than the peduncle, lax, many-flowered. *Floral bract* lanceolate, shorter than the pedicelled ovary. *Flowers* ·5 in. long, pale green. *Sepals* linear-oblong, obtuse, spreading. *Petals* linear, shorter than the sepals, reflexed, their margins, like those of the sepals, revolute. *Lip* quadrate-oblong, recurved at a right angle below the middle, the base with two indistinct confluent calli, the sides entire; the apex truncate, emarginate and minutely erose. *Column* slightly curved, excavated below the stigma, with narrow rounded wings near the apex; the base very broad; the rostellum projecting and triangular. Ridley in Journ. Linn. Soc. XXII, 288; Hook. fil. Ic. Plantar., t. 1858; Hook fil. Fl. Br. Ind. V, 702.

Sikkim-Himalaya, elevation 7,000 feet; Griffith and Hooker; at Rishap, elevation 3,000 to 4,000 feet; Pantling No. 289. Khasia Hills, 5,000 feet. Tenasserim; Parish. Flowers in Sikkim during July and August.

The lip in Mr. Pantling's Sikkim specimens is as above described and as shown in the figure, and in the living plants no nerves are discernable. Sir Joseph Hooker, however, describes the lip of the dried specimens dissected by him as panduriform and 5-nerved. He gives figures of four forms of lip in his Ic. Plantar., t. 1858.

PLATE 39.—*Liparis bistriata*, Parish and Reichb. fil. A plant, *of natural size*. Fig. 1 flower, *side view*, 2 the lip seen from the base, showing the confluent calli, 3 column, stalked ovary and bract, 4 anther, 5 pollinia; *all enlarged*.

12. LIPARIS BOOTANENSIS, Griff. Notul. III, 278.

Epiphytal. *Pseudo-bulbs* narrowly oblong, tapering slightly, 2·5 in. long and ·5 to ·75 in. in diam. at the base; the sheaths of the young growth lanceolate, acuminate.

Leaf solitary from near the apex of the pseudo-bulb, linear-oblong to oblanceolate, acute, narrowed to the sessile or shortly petiolate base, 5 to 10 in. long and 1 to 1·3 in. broad. *Inflorescence* somewhat longer than the leaf, narrowly winged; the peduncle ebracteate, slightly longer than the lax few-flowered raceme; *floral bract* linear-lanceolate, much shorter than the filiform stalked ovary. *Flowers* ·6 in. long, pale-brown, their ovaries usually longer. *Sepals* linear-lanceolate, the dorsal sub-reflexed, the lateral pair lying parallel below and projecting beyond the lip. *Petals* linear, blunt, much decurved, their edges, like those of the sepals, revolute. *Lip* cuneately oblong, deflexed from below the middle, its base bi-auriculate and with two erect tooth-like calli, the sides entire; the apex broad, truncate, erose, mucronate. *Column* curved, its base thickened, the upper third with two long sub-pendulous elongated hook-like triangular wings. *Anther* with a large emarginate lip. *Pollinia* oblong. Griff Itin. Notes, 98; Ic. Pl. Asiat., t. 287; Ridley in Journ. Linn. Soc. XXII, 285; Hook. fil. Fl. Br. Ind. V, 700. *L. lancifolia*, Hook. fil. Ic. Plantar.. t. 1855; Fl. Br. Ind. V., 700.

Sikkim-Himalaya, below Sureil, at 4,800 feet; Pantling Nos. 33 and 343. Bhotan, near the foot of the hills; Griffith. Khasia Hills, elevation 4,000 to 6,000 feet. In Sikkim this flowers in August.

The prevailing colour in the parts of the flower of this is pale brown, but the column is whitish and the anther green, while the two tooth-like calli at the base of the lip are also green.

PLATE 40.—*Liparis bootanensis*, Griff. A plant, *of natural size*. Fig. 1 a flower, 2 lip showing the basal auricles and calli, 3 column, 4 anther, 5 pollinia; *all enlarged*.

13. LIPARIS MANNII, Reichb. fil. in Flora, 1872, 275.

Epiphytal. *Pseudo-bulbs* crowded, narrowly ovoid, compressed, ·75 in. long, often enveloped in ovate-lanceolate acute scarious sheaths ·5 to 1·25 in. long. *Leaf* thickly membranous, solitary, linear-oblong, acute, slightly narrowed to the convolute sessile base; length 4·5 to 7 in., breadth ·4 to ·5 in. *Inflorescence* slightly longer than the leaf; the peduncle twice as long as the raceme, slender, slightly flattened, narrowly 2-winged; the *raceme* about 3 in. long, decurved, many- and rather densely-flowered. *Flowers* yellowish, ·175 in. long; *floral bract* lanceolate, equalling or exceeding the stalked ovary. *Sepals* subequal, oblong, reflexed, their margins recurved, the dorsal sub-acute, the lateral pair blunt. *Petals* linear, blunt, reflexed, shorter than the sepals. *Lip* 3-lobed, without calli, its lower half parallel to the column, its apical half decurved at right angles to the lower; lateral lobes broad, erect, falcate, pointing forwards, sub-acute; apical lobe deflexed, rhomboid, acute, the edges erose. *Column* terete, slender, without wings, the base dilated. *Lip of anther* acute. *Pollinia* linear-clavate. Ridley in Journ. Linn. Soc. XXII, 286; Hook. fil. Fl. Br. Ind. V, 701.

At the base of the range east of the Jaldaka river, at an elevation of 800 feet; in flower during December; Pantling No. 466.

The flowers of this are of a uniform greenish colour. It is closely allied to *L. tenuifolia*, Hook. fil. (Ic. Plantar., t. 2013), differing from that only in having a narrowly winged instead of a terete peduncle, and in the apical lobe of the lip having entire edges and being more acute. Of eleven plants seen in flower by Mr. Pantling, the racemes of all began to expand in the centre, and expansion proceeded towards the base and apex simultaneously.

PLATE 51.—*Liparis Mannii*, Reichb. fil. A plant, *of natural size*. Fig. 1 profile view of a flower with its bract, 2 the lip showing the two erect side lobes and the depressed apical lobe, 3 apex of ovary, column and anther *in situ*, 4 empty anther, 5 pollinia; *all enlarged*.

14. LIPARIS PUSILLA, Ridley in Journ. Linn. Soc. XXII, 294.

Epiphytal. *Pseudo-bulbs* tufted, ellipsoid, about ·5 in. long. *Leaf* solitary, linear-lanceolate or linear-oblanceolate, acute, tapering to the base but not petiolate, 2 to 4 or even 6 or 7 in. long, and from ·25 to ·5 in. broad. *Inflorescence* slightly longer than the leaf; the peduncle usually longer than the raceme, slightly winged, ebracteate; *raceme* rather densely-flowered. *Floral bract* lanceolate, equal to the slender pedicelled ovary. *Flowers* ·12 in. long, pale-green. *Sepals* oblong-elliptic, slightly oblique, obtuse, flat, reflexed. *Petals* linear, blunt, shorter than the sepals, reflexed. *Lip* broadly oblong, deeply grooved from base to apex, much decurved from the middle, the base without calli or auricles, the sides entire; the apex broad, emarginate and entire, or slightly erose. *Column* not curved, sub-cylindric, not winged at the apex, and only slightly thickened at the base. Hook. fil. Ic. Plantar., 1856A.; Fl. Br. Ind. V., 701. *L. auriculata*, Reichb. fil. in Flora for 1872, p. 277 (*not of Miquel*).

Sikkim-Himalaya at 4,000 to 7,000 feet. Clarke, Pantling No. 85. Khasia Hills, 4,000 to 6,000 feet, common. Distrib. Java, Sumatra. Flowering in Sikkim from August to October.

PLATE. 41.—*Liparis pusilla*, Ridley. A plant, *of natural size*. Figs. 1 and 2 front and profile views of a flower, 3 lip, 4 column, 5 anther, 6 pollinia; *all enlarged*.

15. LIPARIS DUTHIEI, Hook. fil. Ic. Plantar., 1857B.

Epiphytal. *Pseudo-bulbs* tufted, ovoid, from ·35 to ·5 in. long. *Leaf* linear-oblanceolate, tapering to the base, petioled or sessile, 1 to 3 in. long and ·2 to ·3 in. broad. *Inflorescence* as long as the leaf; the peduncle winged, slightly longer than the raceme, ebracteate. *Raceme* rather laxly-flowered; *floral bract* linear-lanceolate, equal to or exceeding the stalked ovary. *Flowers* minute (only ·12 in. long), pale green. *Sepals* elliptic-oblong, blunt, reflexed. *Petals* linear, recurved, longer than the sepals. *Lip* quadrate, slightly narrowed to the base, decurved about the middle, the edges near the base with two thickened processes, true calli none; the sides of the lip entire; its apex broad, sub-truncate, slightly emarginate, minutely erose. *Column* slightly curved, rather long, obscurely winged, not thickened at the base. Hook. fil. Fl. Br. Ind. V, 701.

Sikkim-Himalaya, in the valley of the Teesta; elevation 1,000 feet; Pantling No. 179. Kamaon in the Gori valley; alt. 2,000 to 3,000 feet; Duthie.

This species was founded on specimens collected by Mr. J. F. Duthie, Director of the Botanical Survey of Northern India, at an elevation of from 2,000 to 3,000 feet in the Gouri Valley in the Kamaon Himalaya. In Sikkim it has been found only in the valley of the Teesta at elevations of about 1,000 feet. It closely resembles *L. pusilla*, Ridley, but is a smaller plant with a less decurved lip which has slight thickened auricular processes at the base. This has also a longer column than *L. pusilla*. In Sikkim *L. pusilla* grows at elevations of from 5,000 to 7,000 feet.

PLATE 42.—*Liparis Duthiei*, Hook. fil. A plant, *of natural size*. Figs. 1 and 2 front and profile views of a flower, 3 lip, 4 column, 5 anther, 6 pollinia; *all enlarged*.

16. Liparis perpusilla, Hook. fil. Ic. Plantar., t. 1856 B.

Epiphytal. *Pseudo-bulbs* tufted, ovoid-oblong, from ·3 to ·6 in. long. *Leaves* three or four from the upper part of a pseudo-bulb, linear or linear-oblanceolate, acute, very little narrowed to the base, sessile, the midrib stout, length ·75 to 1 in., breadth ·1 to ·15 in. *Inflorescence* erect, much longer than the leaves, winged; the peduncle sometimes with one or two linear bracteoles; *raceme* longer than the peduncle; *floral bract* lanceolate, shorter than the pedicelled ovary. *Flower* ·15 in. long, yellow. *Sepals* broadly elliptic-oblong, obtuse, spreading. *Petals* linear, obtuse, reflexed, about as long as the sepals. *Lip* quadrate, deflexed about the middle, deeply grooved from base to apex; the base with a small crescentic nectary and two elongated divaricating callosities proceeding from it; the anterior or deflexed half with broad rounded apex. *Column* short, thick, with two short sub-triangular wings in its upper part, its base broad. Hook. fil. Fl. Br. Ind. V, 706.

Sikkim, on trees at elevations of 7,000 to 8,000 feet; Hooker, Clarke, Gamble; at Choongthang, elevation 6,000 feet, Pantling No. 380.

Plate 43.—*Liparis perpusilla*, Hook. fil. A tuft of plants, *of natural size*. Fig. 1 a flower, 2 floral bract, pedicelled ovary, column and lip, *seen from the side*, 3 the lip showing the base with the crescentic nectary and diverging callosities, 4 column, 5 anther, 6 pollinia; *all enlarged*.

17. Liparis Griffithii, Ridley in Journ. Linn., Soc. XXII, 285 (*in part*).

Epiphytal. *Pseudo-bulbs* ovoid or oblong, compressed, 1 to 1·75 in. long. *Leaves* two, narrowly oblanceolate, acute, attenuated to the base, but broadened at the point of attachment; length 5 to 9 in., breadth ·75 to 1·1 in. *Inflorescence* shorter than the leaves while in flower, longer in fruit, erect, produced from between the immature leaves; peduncle about equal to the raceme, flattened, winged, dilating downwards and with one or two subulate bracteoles on its margin; *raceme* 3 to 4 in. long. *Flowers* numerous, yellowish-green, ·3 in. across; *floral bract* linear, acuminate, shorter than the pedicelled ovary. *Sepals* sub-equal, oblong, blunt, their margins recurved; the dorsal reflexed; the lateral pair broader, spreading. *Petals* linear, blunt, spreading. *Lip* broadly obdeltoid, strongly recurved from near the base, with a small polished dark green callus immediately against the column; the apex broad, truncate, minutely erose, and with a short blunt apiculus. *Column* long, slender, wingless, the base slightly dilated. *Anther* depressed, its lip truncate and its upper surface partially caruncled. *Rostellum* large, ovate, decurved over the stigma. *Liparis* spec., Griff. Ic. Pl. Asiat, t. 307, fig. 1.

Sikkim; near Pemiongtchi, elevation 5,000 feet; in flower during November; Pantling No. 465.

This resembles *L. bootanensis*, Griff., but differs from that species in having 2-leaved pseudo-bulbs, a more densely-flowered raceme, and a wingless column.

Plate 52.—*Liparis Griffithii*, Ridley. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 bract, stalked ovary, column and lip, *side view*, 3 lip, 4 apex of ovary, column with anther *in situ*, 5 anther from above, 6 pollinia; *all enlarged*.

18. Liparis pygmæa, *new species.*

Terrestrial; whole plant not exceeding 3 in. in height. *Pseudo-bulbs* less than ·5 in. long, narrowly ovoid, loosely enveloped in two or three membranous withered sheaths. *Leaves* two, from the apex of the pseudo-bulb, sub-opposite, ovate, acute, sessile, sheathing at the base, ·5 in. long. *Inflorescence* erect, rather stout, three or four times as long as the leaves, the peduncle ebracteate, the *raceme* 2- to 3-flowered; *floral bract* subulate, less than half as long as the pedicelled ovary. *Flowers* ·25 in. long, yellowish. Dorsal *sepal* oblong, blunt, arching over the column; the lateral pair less than half as broad as the dorsal, lying parallel under the lip and protruding beyond it. *Petals* linear, acute, spreading, the margins reflexed. *Lip* oblong-obovate, slightly deflexed from about the middle; the basal half concave and with entire edges; the apical or deflexed half obscurely erose; the base with a large bilobed callus just under the column; the apex broad, apiculate. *Column* with short wings near the apex; the base very wide, flattened from back to front. *Anther* with an acute beak. *Pollinia* elliptic, rostella two.

Sikkim-Himalaya, below Jongri; elevation 13,000 feet; Pantling No. 449; in flower in June.

Plate 44.—*Liparis pygmæa*, King and Pantling. Two plants, *of natural size*. Fig. 1 flower, *front view*, 2 floral bract, stalked ovary, column and lip, *in profile*, 3 lip, 4 column with anther, 5 anther, 6 pollinia *in situ; all enlarged*.

19. Liparis platyrachis, Hook. fil. Ic. Plantar., t. 1890.

Epiphytal. *Pseudo-bulbs* tufted, oblong, compressed, ·5 in. long, each bearing three to five linear-lanceolate thickly membranous acute leaves with sessile sheathing bases; length ·5 to 1·25 in. *Inflorescence* pendulous, much elongated; the *peduncle* interruptedly winged and with short linear bracteoles; raceme thicker than the peduncle and also with a winged rachis, many-flowered; *floral bract* subulate, much shorter than the pedicelled ovary. *Flowers* ·25 in. long and about ·1 in. broad. *Sepals* elliptic (when flattened out), their edges much recurved, the dorsal narrower than the lateral pair. *Petals* linear, blunt, decurved, their edges revolute. *Lip* about half as long as the sepals, quadrate, deflexed about the middle; the basal half with four calli, one pair conical erect at the sides of the very minute nectary, and a second pair triangular and depressed immediately in front of the former; the decurved apical half of the lip with a broad round apex having a broad short apiculus at its centre. *Column* with a small triangular wing on each side of the stigma, the base dilated and compressed from back to front. *Anther* with broad rounded lip. *Pollinia* clavate-oblong. Hook. fil. Fl. Br. Ind. V, 706.

Sikkim; Treutler, Clarke; at elevations of 4,000 to 5,000 feet. Pantling, at Choongthang; elevation 6,000 feet, No. 417. Flowering in September.

Very sparingly collected hitherto. Mr. Pantling's specimens were found growing on the branches of a bamboo. The more elongated raceme, quadri-tubercular lip, and flattened dilated base of the column distinguish this at once from its nearest ally *L. delicatula*. The sepals, petals, and decurved portion of the lip and anther of this are pale ochraceous; the column and straight or basal portion of the lip are green.

PLATE 45.—*Liparis platyrachis*, Hook. fil. Two plants growing on a branch of bamboo, *of natural size*. Fig. 1 flower, with a part of the winged rachis, 2 column, *front view*, 3 lip, *viewed from above and in front*, 4 the anterior part of the lip, 5 an empty anther, 6 pollinia; *all enlarged*.

20. LIPARIS DELICATULA, Hook. fil. Ic. Plantar., t. 1889.

Epiphytal. *Pseudo-bulbs* tufted, ovoid or oblong, ·35 to ·5 in. long. *Leaves* two, narrowly elliptic, tapering equally to each end, sessile or shortly petioled, rising from near the apex of the pseudo-bulb, ·5 to 1·5 in. long, membranous. *Inflorescence* two or three times as long as the leaves, slender, bearing three or four ovate-lanceolate spreading bracteoles; *raceme* about as long as the peduncle, few-flowered; *floral bract* ovate, acute, shorter than the ovary. *Flowers* ·25 in. long, ochreous, the column pale-green. *Sepals* ovate-lanceolate, acute, their edges recurved, the dorsal one curved backwards, the lateral pair falcate, diverging. *Petals* linear, obtuse, decurved. *Lip* orbicular-oblong, shorter than the sepals; the apex much recurved and with a blunt apiculus, hispidulous; the rest of the surface smooth, the edges entire, the base with several short lateral folds and a central small orbicular nectary with a thickened fold forming a pseudo-tubercle at each side of it. *Column* short, stout, slightly bent forwards and with large broadly triangular wings. Hook. fil. Fl. Br. Ind. V, 705. *L. decurrens*, Ridley in Journ. Linn. Soc. XXII, 291 (*in part*).

The lip as here described would appear to differ from the same part as described by the author of the species in his Icones Plantarum and Flora of British India—a discrepancy which is entirely explained by the fact that, while the former was drawn up from a living specimen, the latter was prepared from a dried one. A careful comparison made in the Kew Herbarium shows that the plants described are identical.

Sikkim-Himalaya; on Sittong; elevation 6,000 feet; Pantling No. 155; flowering in August and September. Khasia Hills; elevation 4,000 to 5,000 feet; Hooker and Thomson, Lobb. Mishmi Hills in Assam; Griffith.

PLATE 46.—*Liparis delicatula*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, 2 lip, except the apex, 3 the recurved apex of the lip, 4 anther, 5 polinia; *all enlarged*.

21. LIPARIS VIRIDIFLORA, Lindl. Gen. and Spec. Orchid., 31.

Epiphytal. *Pseudo-bulbs* orbicular, much compressed, somewhat flattened at the apex, tufted, about 1 in. in diam. *Leaves* two, from the apex of a pseudo-bulb, oblong-lanceolate, acute, keeled, narrowed to the base, sessile, 3 to 6 in. long and ·75 to 1 in. broad. *Inflorescence* from the apex of the pseudo-bulb, at first erect but ultimately pendulous, longer than the leaves; the peduncle winged and bearing several subulate bracts ·2 in. long; *raceme* longer than the peduncle, many-flowered; *floral bract* linear, equal to, or longer than, the pedicelled slightly decurved ovary. *Flowers* ·2 in. long, green. *Sepals* ovate-elliptic, sub-acute, flat. *Petals* linear-oblong, acute, 1-nerved. *Lip* slightly decurved from the base, broadly ovate in outline, narrowed to the base, without side lobes and without calli, concave especially towards the base, the apex contracted to a triangular point at the base of which are two marginal folds simulating tooth-like calli. *Column* sub-terete, slightly curved, the base hardly at all thickened and the apex not winged. *Anther* sub-orbicular. *Pollinia* narrowly triangular. Ridley in Journ. Linn. Soc. XXII, 289; Thwaites' Enum. Pl.

Ceyl., 295; Hook. fil. Fl. Br. Ind. V, 704. *L. elliptica*, Wight Ic. 1735. *L. Wightii*, Reichb. fil. in Walp. Ann. VI, 218. *L. Hookeri*, Ridley *l. c.* 288. *Malaxis viridiflora*, Blume Bijdr. 392, t. 54.

Sikkim-Himalaya, in tropical valleys not ascending over 3,000 feet; Pantling No. 102; in flower in November. Also in Upper Assam and Khasia Hills, in Southern India, in the Nilgiri Hills and in Ceylon. Also in Java.

The pseudo-bulbs of this species are, in specimens from the south of India, somewhat four-angled but compressed; in other specimens they are, when fresh, almost cubical. The inflorescence is at first erect; and, in this attitude, even fruiting racemes are shown in Wight's figure (Ic. 1735). But they really become pendulous at an early stage.

PLATE 47.—*Liparis viridiflora*, Lindl. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 floral bract, pedicelled ovary, and flower, *side view*, 3 lip, *upper surface*, 4 column with anther and apex of ovary, 5 empty anther, 6 pollinia, *seen from the front*, 7 the same, *from the side; all enlarged*.

22. LIPARIS ASSAMICA, *new species*.

Epiphytal. *Pseudo-bulbs* and *leaves* as in *L. resupinata*. *Racemes* three times as long as the leaves, much deflexed. *Flowers* sparse, ·5 in. long; *floral bract* usually shorter than the ovary. *Sepals* unequal, the dorsal erect, narrowly oblong, tapering to the sub-acute apex; the lateral pair larger, blunt, lying close together under the lip. *Petals* linear, obtuse, spreading, shorter than the sepals. *Lip* flat, about as long as the petals, broadly-oblong, with short sagittate auricles at the base; the apex broad, emarginate, with a short apiculus in the sinus; the upper surface with an elliptic nectary and two calli at the base. *Column* broad at the base, tapering upwards, with two shallow broad blunt wings about the middle, not hooked; and with two stout convexities on the posterior surface. *Anther* obtuse. *Pollinia* as in *L. resupinata*. *L. resupinata*, Ridl. var. *Assamica*, King and Pantling *MSS*.

Khasia Hills and Assam; Griffith (Kew Distrib. No. 5082), Wallich, G. Mann; in flower during November.

This variety has not as yet been found in Sikkim, and we include it here owing to its relationship to *L. resupinata*, Ridley, and to its var. *Ridleyi*. This plant has such a different column and lip from these that we have given it specific rank. On the other hand we have ventured to reduce *L. Ridleyi* as a variety of *L. resupinata*, because it differs only in size from the latter, and not at all in form. *L. Assamica* has the pseudo-bulbs and leaves of typical *L. resupinata*, and the larger flowers and much deflexed racemes of its variety *Ridleyi*. But it differs from both in its flat emarginate apiculate lip, and in having a column with no hooked wings, but with two convexities on the back.

PLATE 50.—*Liparis Assamica*, King and Pantling. A tuft of plants, *of natural size*. Fig. 1 a flower, *front view*, 2 side view of floral bract, stalked ovary, column and lip, 3 column, showing its wings and the anther *in situ*, 4 empty anther, 5 pollinia; *all enlarged*.

23. LIPARIS RESUPINATA, Ridley in Journ. Linn. Soc. XXII, 290.

Epiphytal. *Pseudo-bulbs* tufted, ovoid-cylindric, sheathed, ·5 to 1·5 in. long. *Leaves* two to four, membranous, alternate, linear-lanceolate, acute or acuminate, not narrowed to

the base, sessile, 1 to 3 in. long and ·5 in. broad. *Inflorescence* 6 to 12 in. long, sub-pendulous, terete; the peduncle slender and with many lanceolate concave spreading bracteoles; the *raceme* long, laxly many-flowered; *floral bract* linear, shorter or longer than the ovary. *Flowers* golden-brownish, ·25 in. long. *Sepals* oblong, obtuse, longer than the lip, the dorsal retroflexed, the lateral pair spreading and not concealed by the lip, the margins of all recurved. *Petals* linear, obtuse, spreading. *Lip* shorter than the sepals and petals, broadly oblong or ovate, sagittate at the base and with an elliptic nectary and two calli between the folds; the apex broad, obtuse, its edges incurved. *Column* 2-winged, and with a pendent filiform process from each wing. *Pollinia* amber-coloured, translucent, clavate, their inner surfaces concave. Hook. fil. Ic. Plantar., t. 1888; Fl. Br. Ind. V, 705.

Sikkim-Himalaya, alt. 5,000 to 6,000 feet, not uncommon; Pantling No. 60. Khasia Hills, alt. 4,500 to 6,500 feet. Assam; Griffith, No. 5082. In flower in Sikkim from October to December.

Var. *Ridleyi*. Pseudo-bulbs, leaves and flowers larger than in the typical form; the raceme flowerless in its upper part. *L. Ridleyi*, Hook. fil. Ic. Plantar., t. 1887; Fl. Br. Ind. V, 705.

Sikkim-Himalaya, alt. 4,000 to 6,000 feet; Pantling No. 201. In flower during October, November and December.

The variety *Ridleyi* resembles typical *L. resupinata* in structure and colour. It also grows at the same altitudes and flowers at the same season. An examination of the flowers of both by Mr. Pantling several years in succession shows that they vary in exactly the same way. Sometimes the floral bract is longer, sometimes it is shorter than the ovary; its length decreasing towards the apex of the raceme. The lip may be ovate or broadly oblong, but it is always shortly sagittate at the base, the basal folds being prolonged upwards, and between the lobes there is an elliptic nectary. The rachises of the racemes of both are coloured like the flowers, and the pseudo-bulbs and leaves are suffused with the same golden-brownish tint.

PLATE 48.—*Liparis resupinata*, Ridley. A plant, *of natural size*. Fig. 1 a flower, *seen from the front*, 2 a flower, *in profile*, 3 upper part of the column (the anther being removed), 4 an anther, *seen from above*, 5 pollinia; *all enlarged*.

PLATE 49.—*Liparis resupinata*, Ridley, var. Ridleyi. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 profile of a flower, with its stalked ovary and bract, 3 upper part of the column (*the anther removed*), 4 anther, 5 pollinia, 6 inner surfaces of pollinia; *all enlarged*.

4. Didiciea, King and Prain.

Sepals free, spreading, subequal, narrow. *Petals* like the sepals. *Lip* sessile on the base of the column and parallel to it, equal in length to the sepals, fleshy, ovate-oblong, concave, blunt, without lobes or teeth; spur minute. *Column* half as long as the sepals and lip, wingless. *Anther* terminal, 2-celled, convex, rather broad. *Pollinia* 4, free, waxy, and without appendages, unequal in size, obovoid.

As regards habit and external appearance this genus very closely resembles *Tipularia*. It differs, however, from that genus notably in its pollinia having no appendages. The column in this is shorter than in *Tipularia*, and the lip has no lobes of any kind and only

a minute straight pouch, scarcely amounting to a spur; whereas in *Tipularia* the spur is much longer than the ovary and much curved; the lip is also different in the two.

The genus is dedicated to its original collector, Dr. D. D. Cunningham, F.R.S., C.I.E., and the consonants in the name proposed for it are derived from his initials.

DIDICIEA CUNNINGHAMI, King and Prain in Journ. As. Soc. Bengal, Vol. LXV, pt. 2 (1895), p. 119.

Terrestrial, with a small pseudo-bulb bearing from its side a single leaf and from its summit an inflorescence 5 to 9 in. long, about one-third of which is spike. *Leaf* broadly ovate, 3-nerved, sub-acute, the edges undulate, slightly narrowed at the base to the narrow channelled petiole; length 1·5 in., breadth ·85 in.; petiole ·5 in., slightly expanded at the base. *Peduncle* with two or three distinct blunt convolute sheaths; *spike* 1 to 1·5 in. long, laxly-flowered, elongating in fruit. *Flowers* ·1 in. long; *floral bract* minute, triangular, shorter than the pedicel of the ovary. *Sepals* and *petals* sub-equal, narrowly oblong, blunt; spur of the lip very short, pointed.

Sikkim; in the Lachen Valley; the exact elevation unknown, but probably about 12,000 feet; in flower in July. Cunningham (without note of locality or elevation); Pantling No. 396.

This was originally collected by Dr. D. D. Cunningham, F.R.S., C.I.E., in the Sikkim–Himalaya in 1889. It has more recently been brought in by the collectors of the Botanic Garden, Calcutta.

PLATE 50.—*Didiciea Cunninghami*, King and Prain. A plant, *of natural size*. Fig. 1 a flower *front view*, 2, bract, stalked ovary, column and lip, *side view*, 3 lip, 4 column and anther, *front view*, 5 anther, 6 pollinia; *all enlarged*.

5. Dendrobium, Swartz.

Epiphytal; *pseudo-bulbs* short and fleshy or elongated and stem-like, tufted except in Section *Sarcopodium*. *Leaves* never plicate, sessile (except in *Sarcopodium*) with sheathing bases. *Flowers* solitary, or in fascicles or racemes, often large. *Sepals* subequal, the lateral pair obliquely adnate to the foot of the column and forming with it a sac or mentum. *Lip* sessile or clawed at the base, adnate to and incumbent on the foot of the column; side lobes embracing the column, or spreading, or absent; the terminal lobe broad or narrow, flat, convex, concave, or saccate; the disc sometimes lamellate. *Column* short, its foot long or short, with usually a nectar-secreting depression or cavity at its extremity, the apex angled or 2-toothed, *anther* 2-celled. *Pollinia* 4, equal in length, sometimes in free pairs but usually all slightly coherent, the 4 never all quite free, ovoid or oblong, slightly compressed.

In the following account of this difficult genus we have adopted the sections into which Sir Joseph Hooker divides it in the "Flora of British India," although we do not place them in the same sequence, the sections *Cadetia* and *Sarcopodium* being placed near *Bulbophyllum* as being forms connecting typical *Dendrobium* with that genus. We place *Aporum* at the beginning as having flowers more resembling those of *Liparis* than any others of the genus described in these pages. The true relationship of *Stachyobium* is with *Eria;* but, as it is impossible to place it near that genus, we have put it after sect. *Virgatæ*. Four species of *Dendrobium* mentioned in the "Flora of British India" as natives of Sikkim are not now found there, having probably disappeared,

like so many other species, owing to the spread of cultivation. These species are *D. primulinum*, Lindl., *D. crystallinum*, Reichb. fil.; *D. palpebrae*, Lindl.; and *D. Dalhousiæanum*, Wall. It may of course also be possible that these four species were wrongly attributed to Sikkim.

Sect. I.—Aporum.—*Stems* compressed. *Leaves* shortly ensiform, equitant, fleshy or coriaceous, persistent. *Flowers* small, white or yellowish with pink markings shortly pedicelled, solitary, rarely in pairs; *mentum* stout, as long as or longer than the short broad lateral sepals.

Flowers lateral . . . . . *1. D. anceps.*
„ terminal . . . . . *2. D. terminale.*

Sect. II.—Breviflores.—*Stems* tufted, long, terete or clavate. *Leaves* membranous, persistent. *Flowers* small, in short racemes or heads, yellow, often dingy; *mentum* large, saccate; *lip* very short, deeply concave or urceolate, truncate or with short lobes.

3. D. bicameratum.

Sect. III.—Virgatæ.—*Stems* tufted, elongate, slender, but hard rigid and polished, leafy. *Leaves* distichous, long, linear, persistent. *Flowers* small or medium-sized, yellow with purple markings, produced at intervals and not at one period only, in fascicles of two from an internode; *mentum* usually long, stout, incurved; *petals* and *lip* often very narrow.

4. D. Cathcartii.

Sect. IV.—Stachyobium.—*Pseudo-bulbs* short, tufted, with 2 or 3 leaves, or stems elongate and leafy. *Leaves* narrow, membranous, deciduous or persistent. *Flowers* in slender terminal or lateral racemes, small or medium-sized, usually pale-green or yellow with brownish markings; *mentum* rather long, conical, incurved, or short and obtuse; *lip* often with a flat keel on the disc terminating in a truncate crenate callus on the mid lobe.

Pseudo-bulbs with 2 or 3 leaves at the apex.
Pseudo-bulbs broadly ovoid-conic, 2-leaved; terminal lobe of lip triangular, crisped . . . . . *5. D. pygmæum.*
Pseudo-bulbs narrow, conical, 3-leaved. Petals shorter than the sepals, 3-nerved, sub-obtuse. Lip elliptic or obovate-oblong, flat, its margins not ciliolate, its disc thickened and obscurely 3-grooved . . . . . *6. D. porphyrochilum.*
Stems 3 to 10 in. long, with many caducous leaves.
Plant 3 to 6 in. high; lateral sepals broader than the dorsal; side lobes of lip deeply serrate . . . . . *7. D. eriæflorum.*
Plant 6 to 10 in. high; sepals subequal, lanceolate, much acuminate, side lobes of lip serrulate . . . . . *8. D. denudans.*

Sect. V.—Pedilonium.—*Stems* tufted, long, terete. *Leaves* oblong-lanceolate, persistent or deciduous. *Flowers* medium-sized, pink, in short leaf-opposed corymbose racemes, *mentum* very long. *Lip* obovate-spathiform with a long horizontally-toothed claw.

9. D. cumulatum.

Sect. VI.—Formosæ.—*Stems* tufted, erect, with coarse deciduous black hairs on the sheaths. *Flowers* solitary or in racemes, large, white, with faintly coloured lip; *mentum* usually long and funnel-shaped or conical, acute, straight or incurved. *Lip* sessile, its middle lobe often fimbriate on the margin or disc.

Lip fimbriate; flowers less than 1 in. across . . . . . *10. D. longicornu.*
Lip not fimbriate; flowers 3 to 5 in. across . . . . . *11. D. formosum.*

Sect. VII.—Eudendrobium.—*Stems* elongated, stout or slender, cylindric, clavate or nodose. *Leaves* membranous or coriaceous, persistent or deciduous. *Flowers* usually large, in lateral pairs fascicles or racemes, very rarely solitary, variously coloured, white yellow or purple.

Stems usually with many, but never with less than two leaves.

Lip not calceolar.

Lip not convolute, longer than broad.

Lip without side lobes.

Lip obovate . . . . . *12. D. crepidatum.*
Lip elliptic, abruptly acuminate . . . . *13. D. aduncum.*

Lip with short up-turned side lobes, oblong, sub-acute . . . . . *14. D. candidum.*

Posterior part of the lip convolute into a tube, the anterior part expanded into a more or less orbicular open mouth.

Disc not puberulous, mentum entire.

Lip longer than broad, with broad convolute side lobes.

Mentum bulbous, bracts small, sepals obtuse . *15. D. amœnum.*
Mentum conical, bracts large, sepals acute . *16. D. transparens.*

Lip longer than broad, without side lobes . . *17. D. nobile.*
Lip as broad as long, without side lobes . . . *18. D. Pierardi.*

Disc of lip with a green-crested ridge, the anterior lobe crisped; mentum notched at the apex . . *19. D. ramosum.*

Disc papillose; anterior part of lip trowel-shaped, not lobed; mentum conical . . . . . *20. D. heterocarpum.*

Disc tomentose; anterior part of lip orbicular-reniform, mentum blunt . . . . . *21. D. clavatum.*

Lip not convolute, the disc more or less papillose or fimbriate.

Lip papillose (shortly fimbriate in Nos. 22 and 23).

Lip longer than broad.

Lip oblong or oblong-obovate, with two lateral forward-pointing lobes; mentum blunt.

Flowers white; lip with no ridge, but its disc much thickened . . . . . *22. D. stuposum.*
Flowers golden-yellow; disc of lip with a central 3-grooved ridge . . . . *23. D. pauciflorum.*

Lip broader than long or orbicular.

Lip transversely oblong or reniform, not lobed; flowers in fascicles . . *24. D. chrysanthum.*

Lip orbicular or sub-orbicular; flowers in racemes.
Stems clavate.
Racemes 3 or 4 in. long, flowers dingy yellow; lip slightly lobed . . . . . 25. *D. sulcatum.*
Racemes 6 to 10 in. long; flowers brilliant yellow or white; lip not lobed.
Racemes densely crowded . . . . . 26. *D. densiflorum.*
Racemes lax . . . . . 27. *D. Farmeri.*
Stems cylindric . . . . . 28. *D. Gibsoni.*

Lip deeply fimbriate.
Racemes 7- to 12-flowered; lip with one purple blotch . . . . . 29. *D. fimbriatum, var. oculata.*
Racemes 2- to 4-flowered; lip with two purple blotches . . . . . 30. *D. Hookerianum.*
Lip calceolar . . . . . 31. *D. moschatum.*

Leaf solitary—
The lip with a dark blotch . . . . . 32. *D. aggregatum.*
The lip without a blotch . . . . . 32. *D. aggregatum var. Jenkinsii.*

Sect. VIII.—CADETIA.—*Stem* branched, erect, the branches formed by chains of sessile or stipitate pseudo-bulbs. *Leaf* solitary, terminal, coriaceous, flat, persistent. *Flowers* one or two from the base of the leaf, medium-sized, white or pale; *mentum* short, the edge of the lip plicate.

33. *D. Macræi.*

Sect. IX.—SARCOPODIUM.—*Pseudo-bulbs* short, more or less ovoid, erect, springing singly from a stout creeping (often branching) rhizome. *Leaves* two, coriaceous, opposite, from the apex of the pseudo-bulb, flat, persistent. *Flowers* solitary from between the leaves, large; *mentum* short, rounded. *Lip* more or less mobile.

Flowers 1·5 in. in diam.
Anterior lobe of lip sub-reniform, the disc with a large triangular fleshy thickening . . . . . 34. *D. rotundatum.*
Anterior lobe of lip orbicular-ovate, the disc with a broad central ridge . . . . . 35. *D. fuscescens.*
Flowers 3·5 in. in diam. . . . . 36. *D. amplum.*

1. DENDROBIUM ANCEPS, Swartz in Act. Holm. 1800, 246.

Stems compressed, 6 to 30 in. long and from ·25 to ·5 in. broad. *Leaves* fleshy and without apparent nerves when fresh (striate when dry), lanceolate, acute, with sheathing equitant bases; length 1 to 1·75 in., breadth from ·25 to ·5 in. *Flowers* produced singly, ·65 in. to ·75 in. long, yellowish-green, axillary; *floral bract* minute, much shorter than the short pedicelled ovary. *Sepals* unequal, elliptic, the lateral pair larger than the dorsal, all obtuse. *Petals* much shorter than the sepals, broadly elliptic, blunt. *Lip* cuneately oblong, concave, obscurely 3-lobed, the edges entire in the lower part, crisped in the upper and especially at the broad 2-lobed apex; the disc occupied by a shallow thickened depression ending abruptly near the apex.

Column and its foot flat; the latter elongate and with a narrow nectar-secreting cavity at its extremity; *mentum* long, blunt. *Anther* with a truncate lip; *pollinia* onneate, the individual masses clavate. Willd. Spec. Plant. IV, 136; Roxb. Fl. Ind. III, 487; Walp. Ann. VI, 279; Hook. fil. Fl. Br. Ind. V, 724. *Aporum anceps*, Lindl. Gen. and Spec. Orchid. 71 (*excl. cit. Wall*); Bot. Reg. t. 1239; Bot. Mag. t. 3608; Lodd. Bot. Cat. t. 1895; Griff. in Calc. Journ. Nat. Hist. V, 368.

Sikkim-Himalaya, in the bottoms of tropical valleys, Hooker and others; Pantling No. 258; in flower during April and May. Assam, the Gangetic Delta, Burmah; also in the Andaman and Nicobar Islands.

PLATE 54.—*Dendrobium anceps*, Swartz. Plant, *of natural size*. Fig. 1 a flower, 2 floral bract, sub-sessile ovary, column and its foot, *seen from the side*, 3 upper surface of lip, 4 column and its foot, 5 anther, 6 pollinia; *all enlarged*.

2. DENDROBIUM TERMINALE, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 149.

Stems terete and very slender at the base, flattened upwards, 4 to 6 in. long and ·2 to ·25 in. broad. *Leaves* fleshy, showing no nerves when fresh, oblong-elliptic, sub-acute, the base broad and equitant; length ·4 to ·75 in., breadth ·2 to ·3 in. *Flowers* ·5 or ·6 in. long, terminal, solitary or in racemes of two, white or pale pink; *floral bract* lanceolate, much shorter than the pedicelled ovary. *Sepals* unequal, the lateral pair three times as large as the dorsal, elliptic, falcate, sub-acute, 3-nerved; the dorsal ovate. *Petals* elliptic, blunt, about as long as the dorsal sepal but narrower, 1-nerved. *Lip* cuneate-triangular (when spread out), deflexed about the middle, the sides entire, the apex broad, sub-undulate, minutely erose, slightly bifid. *Column* short; its foot six times as long as itself, broad, curved, and with an oblong greenish callus near the lower end. *Mentum* broad, blunt, very long. Lip of *anther* truncate, erose; *pollinia* oblong. *Capsule* ovoid, ·35 in. long. Hook. fil. Fl. Br. Ind. V, 725.

Tropical valleys in Sikkim; Pantling No. 236; in flower during September and October. Tenasserim; Parish. Malacca?

The flowers of this are either white or very pale pink, and the mentum has pink nerves. The lip has a thickened yellow line running along the middle of its upper surface from base to apex. Hitherto this species has not been recorded from Sikkim.

PLATE 55.—*Dendrobium terminale*, Par. and Reichb. fil. A plant, *of natural size*. Fig. 1 flower, *front view*, 2 lip, 3 floral bract, stalked ovary, column and its foot (showing the oblong callus near the apex of the latter), 4 view of inside of an empty anther, 5 pollinia; *all enlarged*.

3. DENDROBIUM BICAMERATUM, Lindl. in Bot. Reg. 1839, misc. 85.

Stems clavate or fusiform, elongate, 3 to 18 in. long and ·35 to ·5 in. thick at the thickest part (but less when mature). *Leaves* elliptic-oblong to elliptic-lanceolate, the apex acute and obliquely and minutely bifid, 1·5 to 3 in. long and ·75 to 1 in. broad. *Flowers* ·4 in. across, yellow marked with red, densely clustered on a short rachis and forming a capitate lateral or sub-terminal raceme; *floral bract*

sheathing the shortly-stalked ovary. Dorsal *sepal* broadly ovate-oblong; the lateral pair triangular, all concave and sub-acute. *Petals* broadly elliptic, obtuse, about as long as the sepals. *Lip* small, fleshy, very concave, broadly triangular (when flattened out) and 3-lobed; the side lobes triangular, acute, erect; the terminal lobe very short, truncate; the disc fleshy, smooth. *Column* very short, and with two large oblong nectar-secreting cells. *Mentum* urceolate. *Anther* fleshy. Saunders' Refug. Botan, t. 143; Hook. fil. Fl. Br. Ind. V, 729. *D. breviflorum*, Lindl. in Journ. Linn. Soc. III, 14. *D. bulboflorum*, Falc. MSS. ex Hook. fil. Fl. Br. Ind. V, 729; Ic. Plant., t. 2028.

Sikkim; common at elevations of from 4,000 to 6,000 feet; Pantling No. 40; in flower during August and September. N.-W. Himalaya, at Mussourie, Proudlock. Dehra Dun, Gamble. On Mahendragiri, Ganjam district, Gamble. Shan Hills, Burmah; Bot. Gard. Collectors.

In the text accompanying the figure of *B. bulboflorum* in the Icones Plantarum Sir Joseph Hooker remarks:—

"Additional specimens and drawings of this species received from Calcutta since its publication in the "Flora of British India" make me doubt whether it is sufficiently distinct from *D. bicameratum*. Mr. C. B. Clarke, from examination of fresh specimens in Sikkim, describes the column as very short with two produced spurs at the base. I have so described it in the "Flora of British India," but on a careful examination of the column I am disposed to think that the lateral keels of the foot of the column have been taken for spurs, or may assume the form of spurs in living specimens."

In our opinion Sir Joseph Hooker's doubt is just, and *D. bulboflorum* is only a young state of this.

Plate 56.—*Dendrobium bicameratum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column and lip, *in profile*, 3 lip, 4 vertical section of the lip, 5 column, 6 anther, *seen from the side*, 7 pollinia; *all enlarged*.

4. Dendrobium Cathcartii, Hook. fil. Fl. Br. Ind. V, 727.

Stems erect, more slender than a goose-quill, not swollen at the base, terete, many-leaved, 15 to 30 in. long. *Leaves* linear-lanceolate, obliquely notched at the apex, slightly narrowed at the base, sheathing, 4 or 5 in. long and ·4 or ·5 in. broad. *Flowers* ·6 in. long, in fascicles of two from an internode; the stalked ovary very slender, ·65 in. long. *Sepals*—the dorsal ovate-lanceolate, acute; the lateral lanceolate. *Petals* narrower than the sepals. *Lip* elliptic-oblong, acute, entire, almost flat. *Column* short, broad; its foot narrower, elongate; *mentum* stout, curved, shorter than the lateral sepals. *Capsule* ovoid, ·6 in. long.

Sikkim; in tropical valleys ascending to 2,500 feet; Pantling No. 114; in flower from April to September.

The flowers are golden yellow, the lip marked with purple.

Plate 57.—*Dendrobium Cathcartii*, Hook. fil. A plant, *of natural size*. Fig. 1, front view of a flower, 2 front view of column with the anther *in situ*, 3 side view of apex of ovary, column and lip, 4 lip, 5 pollinia; *all enlarged*.

5. Dendrobium pygmæum, Lindl. in Wall. Cat. 1999.

Pseudo-bulbs globular, ·5 to ·75 in. long, with scarious sheaths. *Leaves* two, terminal, caducous, linear-oblong, sub-acute, sessile, 1·5 to 3·5 in. long. *Racemes*

terminal or sub-terminal, much shorter than the leaves, solitary or two or three, erect, not more than 1 in. long. *Flowers* ·5 in. long; *floral bract* equalling or exceeding the ovary. *Sepals* oblong-lanceolate, the lateral pair decurved, the dorsal erect. *Petals* oblanceolate, falcate, sub-acute. *Lip* obovate-deltoid (when flattened out), shortly clawed, decurved at the apex of the side lobes; the side lobes long, narrow, entire, sub-acute, almost obtuse at their apices; terminal lobe broadly triangular, crisped; the disc between the side lobes with a broad fleshy ridge emarginate at its apex. *Column* short, rather broad, the edges thickened; its foot long, straight, and spur-like at its extremity. *Lip of anther* very minutely pectinate. Lindl. Gen. and Spec. Orchid., 85; Bot. Reg. 1845, Misc. 62; Hook. fil. Fl. Br Ind. V, 717. *D. peguanum*, Lindl. in Journ. Linn. Soc. III, 19.

Sikkim, at the base of the hills, at elevations of about 1,000 feet. Pantling No. 23; flowering during the cold season. Burmah.

Except the lip and anther, the parts of the flower are white. The lip is pale brown, veined with a darker tint of the same colour, its anterior lobe and the anther being amethyst.

PLATE 58.—*Dendrobium pygmæum*, Lindl. A tuft of pseudo-bulbs growing on a dead branch of a tree, *of natural size*. Fig. 1 a flower, 2 lip, 3 floral bract, ovary, column and lip, *in profile*, 4 column and its foot, 5 anther, 6 pollinia; *all enlarged*.

6. DENDROBIUM PORPHYROCHILUM, Lindl. in Journ. Linn. Soc. III, 18.

Pseudo-bulbs cylindric-conic, thin, ·5 to 1 in. long, narrowed into a short stem. *Leaves* 1 to 3, linear-oblong, obtuse or obliquely notched at the apex, the base not narrowed; length 1 to 2·5 in., breadth ·2 to ·3 in. *Racemes* solitary, terminal, nodding, slightly longer than the leaves, 6- to 10-flowered. *Flowers* ·3 in. long; *floral bract* linear, more than half as long as the stalked ovary. *Sepals* lanceolate, the lateral pair larger than the dorsal. *Petals* shorter than the sepals, oblong, sub-obtuse, 3-nerved. *Lip* elliptic, decurved from the base, flat, not lobed, its edges entire and apex sub-acute; the upper surface with a broad central thickened band terminating near the apex, slightly grooved towards the base so as to form three obscure ridges. *Column* short, broad, its foot dilated, concave. *Mentum* oblique, rounded. *Anther* sub-orbicular, the lip up-turned; *pollinia* elongate-clavate. Hook. fil. in Fl. Br. Ind. V, 716. *D. cæspitosum*, King and Pantling in Journ. As. Soc. Beng. LXIV, pt. 2, 332.

Sikkim; at elevations of from 5,000 to 7,000 feet; Pantling No. 363; flowering during April and May. Khasia Hills; Hooker, Mann, Oldham.

The sepals and petals are pale green with red nerves. The lip is dull brownish-purple, edged with pale green, and the column is white spotted with purple.

PLATE 59.—*Dendrobium porphyrochilum*, Lindl. A plant, of *natural size*. Fig. 1 a flower, *in profile*, 2 floral bract, stalked ovary, column and lip, *seen from the side*, 3 petals, 4 lip, 5 column and its foot, 6 anther, 7 pollinia; *all enlarged*.

7. DENDROBIUM ERIÆFLORUM, Griff. Notul. III, 316.

Stems erect, many-leaved, tapering from base to apex, 3 to 6 in. long, about ·4 in. thick at the base. *Leaves* linear-lanceolate, the apex blunt, oblique, sometimes

notched; length 1·5 to 2·5 in., breadth ·25 to ·35 in. *Racemes* numerous, leaf-opposed axillary, slightly longer than the leaves, many-flowered, nodding. *Flowers* ·5 in. across and about ·65 in. long; *floral bract* lanceolate, minute, much shorter than the stalked ovary. *Sepals*—the dorsal lanceolate, acuminate; the lateral pair larger, falcate, with very broad bases, spreading only slightly. *Petals* linear, acute, lying parallel above the column. *Lip* shorter than the sepals, curved from the narrow base, sessile, broadly oblong-ovate when spread out, very concave, the side lobes narrow, elongate, pectinate-serrate; the middle lobe shorter than the side lobes, acute, much recurved, undulate, a mesial crest running along the disc from its base to the insertion of the terminal lobe. *Column* long, having its foot at a right angle; nectary lanceolate, large, shallow. *Lip of anther* minutely pectinate. Griff. Ic. Plant. Asiat. t. 307; Lindl. in Journ. Linn. Soc. III, 19; Hook. fil. Fl. Br. Ind. V, 715; in Ann. Roy. Bot. Gard., Calc., Vol. V, pt. 1, p. 5, t. 7.

Sikkim; at elevations of from 3,000 to 6,000 feet, common; Pantling No. 194. Khasia Hills, common; in flower during September and October.

Specimens from the Khasia Hills are invariably smaller than those from Sikkim. The colour of the flowers is of various tints of green, the lip and column being slightly spotted with dull purple.

PLATE 61.—*Dendrobium eriæflorum*, Griff. A plant, *of natural size*. Fig. 1 a flower, 2 side view of bract, stalked ovary, column and lip, 3 lip seen from the front, 4 column and its foot, 5 anther, 6 pollinia; *all enlarged*.

8. DENDROBIUM DENUDANS, Don Prod. Fl. Nepal. 34.

Stems terete, sub-erect, many-leaved, the lower leaves sometimes early deciduous, length 6 to 10 in. *Leaves* narrowly oblong, acute or sub-acute, sometimes obliquely notched, not narrowed to the sheathing base; length 2 to 4 in., breadth ·4 to ·9 in. *Racemes* leaf-opposed, slender, decurved, longer than the leaves, many-flowered. *Flowers* ·5 to ·75 in. long; *floral bract* minute. *Sepals* subequal, not wide-spreading, linear, acuminate, falcate. *Petals* similar to the sepals, but smaller. *Lip* much shorter than the sepals, decurved from the base, the lower part sub-quadrate (when spread out) with two long narrow laciniate side lobes; the terminal lobe strongly recurved, serrate, crisped; the disc with an obscurely 3-lined smooth surface with a triangular apex ending at the terminal lobe. *Column* rather long, the margin of the clinandrium denticulate; foot of the column long, curved, stout, concave, hispid near its extremity, without nectary. *Anther* with its lower margin ciliolate. Wall. Cat. 2014 (*in part*); Lindl. Gen. and Spec. Orchid., 84; in Bot. Reg. 1838, Misc. 156 and 1844, 61; in Journ. Linn. Soc. III, 19; Hook. fil. Fl. Br. Ind. V, 715.

Sikkim, at elevations of 3,000 to 5,000 feet; Pantling No. 4. A common plant, in flower during September and October. Distributed westward to Kamaon.

The flowers of this are pale green or whitish; the lip has a band of radiating red lines round its crisped or serrate edges, and the foot of the column is red.

PLATE 62.—*Dendrobium denudans*, Don. A plant, *of natural size*. Fig. 1 a flower, *seen in profile*, 2 floral bract, stalked ovary, column and lip, *seen in profile*, 3 the lip, *as seen from aoove*, 4 column and its foot, 5 an empty anther, 6 pollinia; *all enlarged*.

9. Dendrobium cumulatum, Lindl. in Gard. Chron. 1855, 756.

Stems erect, thin at the base, thickening upwards to ·5 in.; 1 to 2 feet in length. *Leaves* oblong-lanceolate, acute, length 3 to 4 in., breadth ·75 to 1 in. *Flowers* 1·25 in. long, in small corymbiform racemes; *floral bract* lanceolate, much shorter than the stalked ovary. *Sepals*—the dorsal elliptic, sub-acute; the lateral pair similar. *Petals* obovate, larger than the dorsal sepal. *Lip* as long as the petals, obovate-spathulate, with a broad erose emarginate apex, the base contracted into a long narrow claw, geniculate near its insertion to the pouched apex of the mentum, and with a horizontal retrose tooth at the bend. *Column* very short, broad; its foot much produced, narrow, tapering downwards, grooved in the middle and expanded at the lower extremity. *Anther* set at a right angle to the axis of the column, its lip acute. Bot. Mag. t. 5703; Reichb. fil. in Gard. Chron. 1868, 6; Veitch Man. Dendrob. 34; Hook. fil. Fl. Br. Ind. V, 731.

Sikkim; in tropical valleys at elevations up to 3,000 feet; in flower in June and July; Pantling No. 276. Bhotan, Lister. Assam. Khasia Hills; Rita. Also in Upper Burmah.

The flowers of this pretty species are pale purple, the lip being white with sometimes a pink patch near the apex and yellowish at the base; the mentum and apex of column are pale purple. A specimen was collected in Sikkim with the flowers pure white, the apex of the spur being pale green.

Plate 63.—*Dendrobium cumulatum*, Lindl. A plant, *of natural size*. Fig. 1 floral bract, stalked ovary, column and lip, *seen from the side*, 2 longitudinal section of the base of the lip and of the column, showing the junction of the two and the horizontal tooth on the former, 3 the lower half of the lip, showing the horizontal tooth at its flexure, 4 column and its foot, showing the curved sac at the base of the latter, 5 anther seen from behind, 6 pollinia; *all enlarged*.

10. Dendrobium longicornu, Lindl. in Wall. Cat. 1997.

Stems 6 to 12 in. long, tufted, slender (about ·2 in. thick), erect, covered with short coarse black hairs. *Leaves* scattered, linear-lanceolate, slightly hairy; the apices acute, oblique, not notched; length 1·25 to 2 in., breadth ·25 to ·35 in. *Flowers* lateral and terminal, 1·75 to 2 in. long, solitary or in 2- or 3-flowered racemes; *floral bract* lanceolate, hairy, concave, much shorter than the slender pedicelled ovary. *Sepals* ovate-lanceolate, acuminate, keeled (in the living plant). *Petals* lanceolate to ovate-lanceolate, acute or acuminate. *Lip* (when spread out) broadly triangular, 3-lobed, with a broad ridge running along its centre from the base to the apex, dividing near the apex into 3 or 4 short branches; side lobes rounded, boldly nerved, and with broad erose apices; the terminal lobe small, sub-orbicular, fimbriate. *Column* short, the foot broad at its base, contracted towards the apex into a funnel-shaped spur nearly as long as the stalked ovary. Lip of anther truncate, fringed; the inner pollinia very narrow. Lind. Gen. and Spec. Orchid., 80; Bot. Reg. t. 1315; vol. for 1844, Misc. 83; in Journ. Linn. Soc. III, 16; Walp. Ann. VI, 292; Veitch Man. Dendrob. 56; Hook. fil. Fl. Br. Ind. V, 720. *D. flexuosum*, Griff. Notul. III, 317.

Sikkim; common at elevations of from 4,000 to 8,000 feet; Pantling, No. 15; flowering from September to November; eastward along the Himalaya to Nepal, Khasia and Naga Hills.

A species varying somewhat as to the size of its flowers and as to the form of the middle lobe of the lip. A very hirsute form with larger leaves than above described, and with broader sepals and petals, and lip setosely fringed on the central ridge and on the nerves, was described as a distinct species by Griffith (whom Reichenbach *filius* followed) under the name of *D. hirsutum* (Griff. Notul. III, 318; Ic. Pl. As. t. 305; Reichb. fil. in Gard. Chron. 1884, II, 488). But Lindley reduced this species to a variety (*hirsuta*) of this, a course followed by Sir Joseph Hooker (Fl. Br. Ind. l. c.). This species occasionally flowers two years in succession from the same pseudo-bulb. The colour of the sepals and petals is pure white; the lip on the upper surface is pale brown, veined with pale orange and having a central line of that colour.

PLATE 64.—*Dendrobium longicornu*, Lindl. A plant, *of natural size*. Fig. 1 floral bract, stalked ovary, column, spur-shaped mentum and lip, *seen from the side*, 2 petals, 3 lip, *spread out*, 4 column and funnel-shaped mentum (spur), 5 anther, 6 pollinia. *Nos. 1 and 2 of natural size, Nos. 3 to 6 enlarged.*

11. DENDROBIUM FORMOSUM, Roxb. in Wall. Cat. 1998; Fl. Ind. III, 485.

Stems terete, 9 to 18 in. long and ·5 or ·6 in. thick, erect, the sheaths pubescent. *Leaves* oblong, the apex obliquely sub-acute and notched; length 3 to 5 in., breadth 1 to 1·25 in. *Flowers* large, white, in short terminal or lateral racemes of three to five, from 3 to 5 in. across; *floral bract* short, ovate, sheathing. *Sepals* oblong-lanceolate, acute, spreading, keeled. *Petals* much larger than the sepals, sub-orbicular, cuspidate, the edges undulate. *Lip* obcuneate or broadly-obovate; the side lobes small and indistinct; the terminal lobe dilated, its apex very broad, slightly emarginate, minutely mucronate, its edges undulate but not fimbriate; disc with two tubercled yellow central ridges. *Column* rather broad, its edges not winged, its foot short and contracted at the apex into a small sac; the *mentum* half as long as the dorsal sepal, conical. *Anther* quadrate; *pollinia* narrowly oblong. Lindl. Gen. and Spec. Orchid., 81; in Wall. Pl. As. Rar. I, 34, t. 39; in Bot. Regist. 1838, Misc. No. 86; 1839, t. 64; in Journ. Linn. Soc. III, 16; Paxt. Mag. Bot. VI, p. 49, *with fig.*; Fl. des Serres, t. 226 and XVI, t. 1633-4; Williams' Orchid Alb. VII, t. 308; Veitch Man. Dendrob. 44, *with fig.*; Hook. fil. Fl. Br. Ind. V, 721. *D. Infundibulum*, Reichb. fil. (not of Lindl.) in Regel Garten Flora, XXXVI, t. 1253.

At the base of the Sikkim-Himalaya, common; Pantling No. 271; flowering during May. Distributed westward to Nepal and eastward to the base of the Khasia, Assam and Burmese ranges; Andaman Islands.

The lip in the Sikkim plant is yellow and the rest of the flower pure white; the column is yellowish in its lower half. This is a variable species as regards the size of its flowers, and to a slight extent also as to the coloration of the lip. In his "Flora of British India" Sir Joseph Hooker admits three varieties. The plant here figured appears, as far as we have been able to observe, to be constant in the characters above recorded.

PLATE 65.—*Dendrobium formosum*, Roxb. Stem in flower, with young one at its base, *of natural size*. Fig. 1 column with anther *in situ*, and foot, *front view*, 2 vertical section of the preceding, *seen from the side*, 3 pollinia; *all enlarged*. 4 dehisced capsule; *of natural size*.

12. Dendrobium crepidatum, Lindl. in Paxt. Fl. Gard. I, 63, fig. 45.

Stems pendulous, striate, green and white, thin at the base, thickened upwards, covered when dry with the long thin scarious sheaths of fallen leaves; length 6 to 18 in. *Leaves* linear-lanceolate, acuminate, 2 to 4 in. long, breadth ·4 to ·6 in. *Flowers* ·75 to 1 in. in diam., solitary or two or three on very short bracteate peduncles from the very slightly swollen nodes of the leafless stems; the stalked ovaries divergent, very long, purple. *Sepals* broadly oblong, subequal, sub-obtuse. *Petals* broadly ovate, not longer than the sepals. *Lip* broadly obovate, pubescent, the edges undulate; the apex broad, sometimes retuse; the base narrowed to a short claw with a short transverse ridge in front of it and a small pit behind. *Column* very short, broad; *mentum* short, obtuse. *Anther* very convex. *Capsule* clavate, 1·75 in. long. Bot. Mag., t. 4993, 5011. Veitch Man. Dendrob. 33; Hook. fil. Fl. Br. Ind. V, 740. *D. Lawanum*, Lindl. in Journ. Linn. Soc. III, 10; Dalz. and Gibs. Bomb. Fl. 261. *Dendrochilum roseum*, Dalz. in Hook. Kew Journ. IV (1852). 291.

Sikkim; in tropical valleys ascending to 3,500 feet; Pantling No. 308; in flower in April and May. Assam and Khasia Hills; also in Upper Burmah, and in the Concan and Canara in Southern India.

The flowers of this are either pink or white, the lip having a large yellow spot on it. The species as found in Assam and the Khasia Hills has rather handsome flowers, but the form found in Sikkim is unattractive in appearance. It is very interesting, however, as an example of a *Dendrobium* which is usually, if not invariably, self-fertile. An examination of many flowers by Mr. Pantling showed that the pollinia had left the anther, and that the pollen had begun to disappear in the tissues of the stigma before the bud had fully opened. Fig. 3 shows the condition in a bud just about to open. In a plant brought from the Khasia Hills in February of the present year, and which flowered at Mongpoo during the following April, the flowers were of the usual Assam and Khasia type. They were large, handsome, and remained fully expanded for five days, during which time no change occurred in the column of any of them; but not one of them was self-fertile. The Sikkim plant thus appears to owe its mean appearance to the fact that it is self-fertile, and to represent a stage in the transition to cleistogamy.

Plate 66.—*Dendrobium crepidatum*, Lindl. A plant, *of natural size.* Fig. 1 a flower, 2 lip, 3 column and its foot, *the anther displaced and showing the absorption of the pollinia in the stigma,* 4 anther, 5 pollinia; *all enlarged*; 6 a leaf, *of natural size.*

13. Dendrobium aduncum, Wall. in Bot. Reg. 1842, Misc. 62, 1846, t. 15.

Stems branching or viviparous, thinner than a goose-quill, pendulous, 1 to 2 feet long. *Leaves* narrowly lanceolate, acute or acuminate, obliquely and minutely bifid; length 2 to 3 in., breadth ·35 to ·75 in. *Flowers* ·75 to ·9 in. long, in short flexuose racemes from the naked stems, the rachis between the flowers zigzagged and with several minute membranous scales; *floral bract* sheathing, obtuse, much shorter than the stalked ovary. Dorsal *sepal* ovate, acute; the lateral pair larger, triangular sub-rhomboidal. *Petals* similar to the dorsal sepal, but broader. *Lip* shorter than the lateral sepals, adpressed to the column, broadly elliptic, concave, its apex abruptly acuminate, its inner surface pubescent but for a square glistering area near the short decurved claw.

Column very short, pubescent in front inside, with two large rounded crenulate and beaked shoulders pointing forward; the foot long, strongly curved, tapering. Apex of anther rich purple, papillose; its lip smooth, truncate, erose. Bot. Mag. t. 6784; Veitch Man. Dendrob. 14; Walp. Ann. VI, 295; Hook. fil. Fl. Br. Ind. V, 730.

Sikkim; in tropical valleys up to 2,000 feet; Pantling No. 272. Bhotan, Lister. Assam, Khasia Hills and Upper Burmah. In flower during June to August.

The prevailing colour in the flower is pale purple; the anther dark purple.

PLATE 67.—*Dendrobium aduncum*, Wall. A plant, *of natural size*. Fig. 1 floral bract, stalked ovary, column and lip, *seen from the side*, 2 vertical section of the foregoing, 3 lip, 4 column and its foot with the anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

14. DENDROBIUM CANDIDUM, Wall. in Lindl. Bot. Reg. 1838, 36; 1844, Misc. 32.

Stems much thinner than a goose-quill, cylindric, 6 to 12 in. long, erect. *Leaves* narrowly lanceolate, the apex obtuse and obliquely bifid; length 2 to 3 in., breadth ·25 to ·35 in. *Flowers* 1 in. long, white, one to three from a short sheathed peduncle from the leafless stems; sheaths of the peduncle ·25 to ·35 in. long, hyaline. *Sepals* broadly lanceolate, sub-acute or obtuse, subequal. *Petals* like the sepals, but more acute. *Lip* as long as the sepals, oblong-lanceolate, the apex suddenly acute; side lobes about the middle short, rounded, incurved, the disc between them with an elongated callus. *Column* short, the foot very broad and deeply excavated. *Mentum* broad, rounded, short. *Anther* large, sub-orbicular, papillose. Paxt. Fl. Gard. I, 63, fig. 41; Walp. Ann. VI, 286; Hook. fil. Fl. Br. Ind. V, 735; in Ann. Roy. Bot. Gard., Calcutta, Vol. V, pt. 1, 12, t. 19. *D. spathaceum*, Lindl. in Journ. Linn. Soc. III, 15; Hook. fil. Fl. Br. Ind. V, 737.

In the Lachen Valley in Sikkim at an elevation of from 6,000 to 7,000 feet; Hooker; Pantling No. 367; also in Western Sikkim, near Pemiongtchi; in flower during May and June. Khasia Hills.

This species closely resembles *D. amœnum*, Wall., but it has pure white flowers, with only a spot of yellow near the base of the lip. It is a very local and scarce plant. Judging from the descriptions of *D. spathaceum*, Lindl., that species must be identical with *D. candidum*, which as the earlier published name must be kept up. We have therefore reduced *D. spathaceum* here.

PLATE 68.—*Dendrobium candidum*, Lindl. A plant, *of natural size*. Fig. 1 a bract, stalked ovary, column and lip, *seen from the side, the sepals and petals having been removed*, 2 lip, 3 vertical section of lip to show the outline of the callus within, 4 column with its foot, 5 anther, 6 pollinia; *all enlarged*.

15. DENDROBIUM AMŒNUM, Wall. in Lindl. Gen. and Spec. Orchid., 78, (*excl. syn. D. aphyllum*).

Stems slender, slightly thickened at the nodes, pendulous, 12 to 30 in. long. *Leaves* oblong-lanceolate; the apex acute, oblique; length 2·5 to 4 in., breadth ·35 to ·7 in. *Flowers* 1·5 (rarely 2 in.) across, two or three from very short bracteate peduncles springing from the nodes of leafless stems. *Sepals* oblong-lanceolate, obtuse or acute. *Petals* larger, ovate, obtuse or acute. *Lip* as long as the sepals, oblong-obovate (when spread out), clawed at the base; the side lobes broad, rounded, convolute;

the terminal lobe orbicular with undulate edges, puberulous on both surfaces, the disc sub-villous. *Column* broad at the apex, the foot tapering, flat in its upper part; the nectary large, its upper margin erose and its lower with two calli, the centre occupied by a thickened line. *Anther* minutely papillose. Lindl. in Bot. Reg. 1844, 49; in Journ. Linn. Soc. III, 12; Bot. Mag., t. 6199; Reichb. fil. in Gard. Chron. 1875, I, 305, figs. 57, 58; 1881, II, 625, fig. 126; Veitch Man. Dendrob. 17; Hook. fil. Fl. Br. Ind. V, 738. *D. mesochlorum*, Lindl. in Bot. Reg. 1847, under t. 36; Paxt. Fl. Gard. Vol. I, 63, fig. 43. *D. Egertoniæ*, Lindl. l. c.; Paxt. Mag. l. c. fig. 44.

Sikkim; in tropical valleys, up to elevations of 4,000 feet; Pantling No. 267; a common plant; flowering during June. Westward to Gharwal and eastward to Bhotan, Sylhet and Burmah.

One of the most charming of Indian Dendrobes. The flowers smell of violets; the sepals and petals are white tipped with violet, and the lip is white with a purple spot near the apex and a flush of greenish yellow towards the middle; the upper part of the column is green, the lower part of it and the whole of the mentum are violet. This species is pendulous, while *D. transparens*, its near ally, grows erect.

PLATE 69.—*Dendrobium amœnum*, Wall. A plant, *of natural size*. Fig. 1 bract, stalked ovary and lip, *in profile*, 2 lip, 3 column and its foot, 4 vertical section of the sac formed by the union of the lip with the produced foot of the column, 5 anther, 6 pollinia; *all enlarged*.

16 DENDROBIUM TRANSPARENS, Wall. Cat. 2008-1.

Stems slender, erect, with a narrow thickening at the nodes, 12 to 24 in. long. *Leaves* linear-lanceolate, the apex acute and oblique; length 3 or 4 in., breadth ·35 to ·5 in. *Flowers* 1·5 in. across, in pairs from the leafless stems; *floral bract* broadly lanceolate, scarious, sometimes ·5 in. long, but always much shorter than the stalked ovary. *Sepals* subequal, lanceolate, acute. *Petals* about the length of the sepals, but ovate and with blunter apices. *Lip* as long as the sepals, broadly elliptic-obovate (when spread out), clawed at the base; the side lobes broad, erose and convolute; the terminal lobe sub-orbicular, undulate; the upper surface pubescent. *Column* with two horn-like processes at the apex, the foot narrowed and with a small nectar-secreting cavity at its apex. *Mentum* short, conic, obtuse. *Anther* puberulous; its lip truncate, entire. Lindl. Gen. and Spec. Orchid., 79; in Bot. Regist. 1844, Misc. 62; in Journ. Linn. Soc. III, 12; Bot. Mag. t. 4663; Paxt. Fl. Gard. I, 134, t. 27; Veitch Man. Dendrob. 81; Hook. fil. Fl. Br. Ind. V, 738. *D. Henshalli*, Reichb. fil. in Bonplandia, III, 226. *Dendrob.* Griff. Notul. 198, No. 1135, p. 198.

Sikkim; common at the base of the range, and ascending to elevations of 3,000 feet; Pantling No. 79; in flower during May. Westward to Kamaon and eastwards to Assam and the Khasia Hills; also in the Chittagong Hills.

The petals are white, occasionally suffused with pink; the lip has a large purple patch along its middle, with purple lines towards the base; the column is greenish-yellow with a purple patch at its lower end, and the stigma has red lines round it. Although the expression side lobes has been used in describing the convolute part of the lip, there are no distinctly marked side lobes.

PLATE 70.—*Dendrobium transparens*, Wall. A plant and Fig. 5 a capsule, *of natural size*. Fig. 1 lip, 2 column and its foot, 3 anther, 4 pollinia; *all enlarged*.

17. Dendrobium nobile, Lindl. Gen. and Spec. Orchid., 24.

Stems erect, somewhat compressed, ·4 in. thick near the apex, thinner at the base, 12 to 24 in. long. *Leaves* coriaceous, oblong, the apex sub-obtuse and obliquely notched, slightly narrowed to the base; length 3 to 4·5 in., breadth ·75 to 1·1 in. *Flowers* 2 to 3 in. across, solitary, or two to four in short racemes from the nodes of the leafy or leafless stems; the *floral bracts* ·25 to ·35 in. long, loose, scarious. *Sepals* subequal in length, the dorsal oblong-elliptic, the lateral pair oblong, all obtuse. *Petals* elliptic, broader than the sepals. *Lip* broadly ovate-oblong, pubescent, the margins of the lower half incurved, the terminal half cucullate, with recurved spreading margins, the base with a very short claw. *Column* short, erose just behind the anther, very broad opposite the stigma. *Mentum* conical, blunt, short. *Anther* conical, its lip truncate and erose; *pollinia* elongate, narrow. Lindl. Sert. Orchid., t. 3; in Bot. Reg. 1844, Misc. 48; in Journ. Linn. Soc. III, 12; Paxt. Mag. VII, t. 7; Hartm. Parad. I, t. 11; Reichb. fil. in Gard. Chron. XVII, 366; Williams Orch. Alb. t. 214; Veitch Man. Dendrob. 63, with fig. and var. *nobilius*, 64; Reichenbachia, II, t. 58 (var. *Sanderiana*); Hook. fil. Fl. Br. Ind. V, 740. *D. cærulescens*, Wall. in Lindl. Sert. Orchid., t. 18; Bot. Reg. l. c. *D. Lindleyana*, Griff. Notul. III, 309 (excl. fig.); Lindl. in Journ. Linn. Soc. III, 13.

Sikkim; ascending to 5,000 feet; Hooker and many collectors, Pantling No. 362; in flower during April and May. Westward to Nepal and eastward to Bhotan, the Khasia Hills, Assam and Upper Burmah. Distrib. China.

A beautiful species, very common in Sikkim. The flowers vary both in size and shade of colour; but in Sikkim the sepals and petals are always purple, shading off into white at the base. The lip has a central blotch of very deep purple, surrounded by a broad margin of pale yellow or white; the anther is purple and the column green with vertical purple lines in front. Plants have been observed of which the stems elongated annually and produced flowers four years in succession.

Plate 71.—*Dendrobium nobile*, Lindl. Part of a flowering plant of natural size, and a whole plant much reduced in size. Fig. 1 base of lip to show the short claw, 2 column with its foot and the anther *in situ*, 3 anther, 4 pollinia; *all enlarged.*

18. Dendrobium Pierardi, Roxb. in Hooker Exotic Flora, t. 9.

Stems slender, pendulous, slightly swollen at the nodes, 2 to 4 feet long, smooth. *Leaves* sessile, rather thick, lanceolate to ovate-lanceolate, sub-acuminate, caducous, length 2 to 4 in., breadth 1 to 1·5 in. *Flowers* 1·25 to 1·75 in. across, solitary or two or three from very short minutely bracteate peduncles springing from the slightly swollen nodes of the leafless stems. *Sepals* subequal, oblong-lanceolate, sub-acute. *Petals* much broader than the sepals but not longer, elliptic, blunt. *Lip* sub-orbicular (when spread out), with a very short claw but without side lobes; the edges erose near the base, shortly ciliate on the anterior half, the upper surface pubescent, convolute to form a tube with a wide circular shell-like open mouth. *Column* and its foot about equal in length; the latter with a transversely elliptic nectary at its extremity. *Anther* with a curved erose lip. *Capsule* clavate, cylindric, 2 in. long. Roxb. Fl. Ind.

III, 483; Lindl. Gen. and Spec. Orchid., 79; in Bot. Reg. t. 1756; Wall. Cat. 2007; Bot. Mag. t. 2584; Wight Ic. t. 908; Lodd. Bot. Cab. t. 750; Veitch Man. Dendrob. 69; Hook. fil. Fl. Br. Ind. V, 738.

Sikkim; in tropical valleys as high as 3,000 feet; Pantling No. 70. Assam, Bengal, and southwards to Tenasserim and the Peninsula of India; in flower during April and May.

The prevailing colour of the flower is a beautiful rose or pale purple, and the texture is translucent, the lip being pale yellow with radiating lines of purple at the base. There is some variation in the species; and one form, which is characterised by smaller flowers with shorter ovaries and a lip with a longer tube and a shorter limb, was described as a species by Robert Brown under the name *D. cucullatum* (Bot. Reg. t. 548). Sir Joseph Hooker (Fl. Br. Ind. V, 739) considers it as merely a variety of *D. Pierardi*. It is, however, a variety which does not now occur in Sikkim, being found chiefly in the western coast of Southern India.

PLATE 72.—*Dendrobium Pierardi*, Roxb. Part of a plant in flower, *of natural size*. Fig. 1 a flower, 2 the claw of the lip, 3 the lip, 4 column and its foot, 5 anther, 6 pollinia; *all enlarged*.

19. DENDROBIUM RAMOSUM, Wall. Cat. 2003.

Stems slender, pendulous, often branched or viviparous, 12 to 24 in. long. *Leaves* lanceolate, acute or acuminate, 3 to 5 in. long and ·65 to 1 in. broad. *Flowers* 1·25 to 1·5 in. long, leaf-opposed, solitary or in racemes of two; *floral bract* broadly lanceolate, much shorter than the stalked ovary. Dorsal *sepal* elliptic, narrowed towards the obtuse apex; lateral sepals much broader, their apices narrowed, blunt. *Petals* as long as the dorsal sepal, oblong, sub-spathulate, blunt. *Lip* very concave and much curved from the base, sub-trapezioidly obovate (when spread out), its base slightly auricled; the side lobes large, broad, convolute; the terminal lobe sub-orbicular, bifid, deflexed and crisped; the disc from about the middle with a villous green papillose crest. *Column* short, stout; the mentum broad and with a short sub-bifid pouch at its extremity. *Anther* with an erose lip. *D. Ruckeri*, Lindl. in Bot. Reg. 1843. Misc. 8, t. 60; Reichb. fil. in Walp. Ann. VI, 288; Hook. fil. Fl. Br. Ind. V, 733.

Sikkim; on Sittong, elevation 4,000 to 5,000 feet; Pantling No. 117. Bhotan, Lister. Khasia Hills, Rita; in flower during April and May.

The prevailing colour in the flower is primrose yellow. The lip has numerous radiating streaks of brownish-purple, and the mentum externally is often suffused with the same colour. The villous disc on the mid lobe of the lip is green. Wallich's specimens of this are in poor condition, but a careful examination of them and a comparison with specimens of *D. Ruckeri*, Lindl., have convinced us that the two species are identical. We therefore restore the older name of Wallich.

PLATE 73.—*Dendrobium ramosum*, Wall. A plant, *of natural* size. Fig. 1 a flower, with its stalked ovary and bract, 2 column, mentum and lip, *seen from the side, the sepals and petals being removed*, 3 posterior part of lip, *seen from above*, 4 transverse section of the lip, *flattened out*, 5 column *in profile*, 6 front of column showing the emarginate saccate terminal pouch, 7 anther, as seen from behind, 8 pollinia; *all enlarged*.

20. Dendrobium heterocarpum, Wall. in Lindl. Gen. and Spec. Orchid., 78.

Stems erect, as thick as a goose-quill at the base but much thicker (·5 in.) upwards, ribbed, sheathed, 9 to 18 in. long. *Leaves* narrowly elliptic-oblong, sub-acute; length 3 to 5 in., breadth ·5 to 1 in. *Flowers* 2 to 2·5 in. across, solitary, or two or three on a very short peduncle from the leafless stems; *floral bract* broad, obtuse, convolute, much shorter than the stalked ovary. *Sepals* subequal, the dorsal linear-oblong, sub-acute; the lateral pair lanceolate. *Petals* as long as the dorsal sepal, broadly lanceolate. *Lip* longer than the lateral sepals, trowel-shaped, acute, decurved, the edges undulate, the sides of the base somewhat convolute, the disc papillose-pubescent. *Column* very short, broad above the foot, tapering, excavated and with a raised line down the centre. *Mentum* short, conical, obtuse. *Anther* convex, grooved on the upper surface, its edge erose, the inner pollinia very narrow. Wall. Pl. As. Rar. II, 84, t. 196; Lindl. in Bot. Reg. 1844, Misc. 49; Bot. Mag., t. 4708 and 4978 (var. *Henshallii*); Fl. des Serres VIII, t. 842; Gard. Chron. 1885, I, 472, fig. 84 B; Hook. fil. Fl. Br. Ind. V, 737. *D. aureum*, Lindl. Gen. and Spec. Orchid, 77; in Bot. Reg. 1839, t. 20 (var. *pallida*); Wight Ic., t. 1646; Veitch Man. Dendrob. 19 *with fig.*; Reichb. fil. in Gard. Chron. 1880, 72 (var. *Philippinensis*); Reichenbachia II, t. 63. *D. rhombeum*, Lindl. in Bot. Reg. 1843, t. 17. Dendrobium sp. Griff. Notul. III, 304; Ic. Pl. Asiat., t. 306.

Sikkim; in tropical valleys up to 3,500 feet; in flower during April; Pantling No. 200. The Himalaya westwards to Nepal; Assam, the Khasia Hills, Upper Burmah; also in the hill ranges of Southern India and in Ceylon. Distribution; Java and the Philippine Islands.

The prevailing colour in the flower is white or pale ochraceous, often tinged with green; the lip being either yellow or white, with a yellow disc and many red or purple radiating lines. The flowers are faintly fragrant.

Plate 74.—*Dendrobium heterocarpum*, Wall. A plant in flower and one in fruit. Fig. 1 a floral bract flattened out and a leaf, 2 sepals and petals; *all of natural size*; 3 column and its foot and mentum, showing the vertical rib down the excavated centre of the latter, 4 anther, 5 pollinia, 6 an inner pollinium; *all enlarged.*

21. Dendrobium clavatum, Wall. Cat. 2004.

Stems somewhat thicker than a swan's quill, scarcely clavate, the leafy stems smooth, the leafless vertically ridged, 18 to 30 in. long. *Leaves* coriaceous, narrowly oblong, the apex blunt or sub-acute, very slightly notched; length 3·5 to 5 in., breadth ·8 to 1·5 in. *Inflorescence* from the leafless stems of the previous year; the *peduncle* 2 or 3 in. long, erect, bearing several tubular membranous oblong sheaths; the *raceme* two or three times as long as the peduncle, horizontal or decurved, bearing from four to six rather distant flowers 2 to 3 in. in diameter. *Floral bract* membranous, oblong, sub-acute, shorter than the slender pedicelled ovary. *Sepals* oblong, sub-acute or blunt. *Petals* broadly ovate, sub-acute. *Lip* narrowed and convolute in its lower part, the anterior part expanded, concave, orbicular-reniform, its margins sub-fimbriate near the base, undulate near the apex; the upper surface tomentose. *Column* and foot both short, the latter with a nectary near the base; *mentum* short. Lindl. in Paxt. Fl. Gard. II, 104, fig. 189; Bot. Mag., t. 6993; Reichb. fil. in Walp. Ann. VI, 293; Hook. fil. Fl. Br. Ind. V, 946.

Sikkim; at Tendong, elevation about 3,000 feet; Pantling; in flower during May and June. Nepal; Wallich. Kamaon; Strachey and Winterbotham. Khasia Hills, elevation 5,000 to 6,000 feet.; G. Mann. Shan Hills in Burmah; King's Collector.

The flowers of this handsome species are of rather a dark yellow, the lip having a large purple blotch near its centre, and its edges being of a paler yellow than the rest of the flower. It has been collected only once in Sikkim; and in Assam, the Khasia Hills, and Upper Burmah, where it occurs more plentifully than in Sikkim, it is by no means abundant. Specimens were collected many years ago in Nepal by Wallich, and in Kamaon by Strachey and Winterbotham; but of late years it does not appear to have been found in the Western Himalaya.

PLATE 60.—*Dendrobium clavatum*, Wall. A plant; *of natural size*. Fig 1 part of upper surface of lip to show the papillæ, 2 column with the anther *in situ*, 3 anther, 4 pollinia; *all enlarged*.

22. DENDROBIUM STUPOSUM, Lindl. in Bot. Reg. 1838, Misc. 52, and 1844, 52.

Stems tufted, not branched but often viviparous, about ·25 in. thick near the apex, thinner near the base, sulcate, 6 to 10 in. long. *Leaves* narrowly oblong, sub-obtuse, slightly notched, 2·25 to 3 in. long. *Flowers* ·65 in. across, white, in small few-flowered short racemes from the nodes of the leafless stems; *peduncles* slender with scattered green sheaths; *floral bract* linear-oblong, obtuse. *Sepals* ovate, the dorsal acute and shorter than the keeled acuminate-aristate lateral pair. *Petals* oblong-obovate, shortly clawed; the apex blunt, slightly apiculate, ciliolate-erose. *Lip* oblong-obovate, not clawed; the side lobes long, shallow, with truncate ciliate-erose apices; the terminal lobe ovate-orbicular, its upper surface covered with gland-tipped hairs and with a dirty yellow blotch in the middle. *Column* broad, the foot with an elongated vertical nectary contracted near the middle; the stigma with a small gland on each upper corner; *mentum* short, wide, obtuse. *Anther* with a small quadrate lip. Hook. fil. Fl. Br. Ind. VI, 186; in Ann. Bot. Gard. Calc., V, pt. 1, 13, t. 20. *D. sphegidoglossum*, Reichb. fil. in Bonplandia, II, 58; Hook. fil. Fl. Br. Ind. V, 737.

Sikkim; in the valley of the Teesta at an elevation of 1,200 feet; Pantling No. 84; in flower in June; only once collected. Khasia Hills and Tenasserim.

The flowers are white with a blotch of dull yellow on the lip, and the mentum is suffused with green.

PLATE 75.—*Dendrobium stuposum*, Lindl. A plant, *of natural size*. Fig. 1 a peduncle with its bracts, the floral bract, stalked ovary and flower, *seen from the side*, 2 flower, *front view*, 3 lip, seen in profile, the sepals and petals removed, 4 longitudinal section of the lip, 5 column with its foot, the anther *in situ*, 6 anther seen from the back, 7 pollinia; *all enlarged*.

23. DENDROBIUM PAUCIFLORUM, King and Pantling in Journ. As. Soc. Beng. LXIV, pt. 2, 332.

Stems 2 to 3 feet long, as thick as a goose-quill, branching, tapering toward each extremity, pendulous, smooth when young but slightly grooved when old. *Leaves* linear-lanceolate, obliquely and minutely emarginate at the apex, 3 to 4 in. long and ·5 to ·75 in. broad. *Racemes* from the leafless stems, lateral, about ·5 in. long, 1- to 4-flowered, the *peduncles* very slender; *floral bract* ovate, blunt, ·1 in. long. *Flowers* ·75 in. long.

Lateral *sepals* ovate, not wide-spreading; the dorsal narrower, blunt. *Petals* ovate-lanceolate, ciliolate. *Lip* shorter than the lateral sepals, oblong, clawed; side lobes narrow, directed forwards, fringed, the disc between them much thickened and bearing on its surface three raised lines; terminal lobe flat, hispid, with no central thickening or lines. *Column* short, broad; its foot longer, and with a large nectary having its upper margin deeply bifid.

Sikkim; above Engo, at an elevation of about 4,000 feet; Pantling No. 172; in flower in June; also in the Teesta Valley at an elevation of 2,000 feet.

The flowers are of a golden yellow colour, the sepals and petals being broadly margined with purple. The apical lobe of the lip is spotted with red. Its nearest ally is probably *D. stuposum*, Lindl., which has, however, white flowers with no ridge on the disc and with a different column.

PLATE 76.—*Dendrobium pauciflorum*, King and Pantling. Pieces of a plant, *of natural size*. Fig. 1 a flower, *seen from the side*, 2 lip, 3 section of lip below the basal lobes, 4 floral bract, stalked ovary, column and its foot, *seen from the side*, 5 column with anther *in situ* and mentum, 6 anther, *seen from the side*, 7 pollinia; *all enlarged*.

24. DENDROBIUM CHRYSANTHUM, Wall. Cat. 2012.

Stems dark-green, except where covered by the scarious white-lined tubular sheaths, pendulous, 2 to 3 feet long, about half an inch thick near the middle, thinner at the base and apex. *Leaves* caducous, lanceolate, acuminate, the base rounded, sheathing; length 3 to 6·5 in., breadth 1 to 1·5 in. *Flowers* rather fleshy, 1·35 to 1·75 in. in diameter, in fascicles of 2 to 4 from very short bracteolate peduncles from either leafy or leafless stems. *Sepals* subequal, broadly ovate, fleshy, keeled, concave, obtuse, the lateral pair slightly falcate. *Petals* ovate-orbicular, concave, entire or minutely erose, slightly longer than the sepals. *Lip* transversely orbicular-oblong or reniform (when flattened out), concave, tomentose towards the sub-fimbriate margin, abruptly clawed at the base. *Column* broad, concave, the foot with a transverse ridge towards the lower end, and below it a large nectary; the stigma emarginate at the lower edge. *Mentum* short, wide, blunt. *Anther* 3-ridged on the anterior surface, *pollinia* oblong. *Capsule* sub-ovoid or pyriform, grooved, 1·5 to 2 in. long. Lindl. Gen. and Spec. Orchid., 80; in Journ. Linn. Soc. III, 8; in Bot. Reg., t. 1299; Garten-flora, t. 446; Veitch Man. Dendrob. 28; Hook. fil. Fl. Br. Ind. V, 747. *D. Paxtoni*, Lindl. in Bot. Reg. 1839 (Misc. 56); Fl. des Serres, VII, t. 725.

Sikkim; common at elevations from 3,000 to 6,000 feet. Pantling No. 10. Westward to Nepal and eastwards to Bhotan and the Khasia Hills; also in Burmah; flowering from July to October.

The flowers are yellow, the lip having two dark sub-orbicular spots of brownish-purple.

PLATE 77.—*Dendrobium chrysanthum*, Wall. Part of a flowering stem, *of natural size*. Fig. 6 capsule, *of natural size*; 1 lip, 2 a piece of the lip to show the villous upper surface, 3 column and its foot, with the anther *in situ*, 4 anther, 5 pollinia; *all enlarged*.

25. DENDROBIUM SULCATUM, Lindl. in Bot. Reg. 1838, t. 65.

Stems tufted, stout, compressed-clavate, from ·4 to ·6 in. broad in the upper part, thin towards the base, sulcate, erect, 6 to 12 in. long. *Leaves* coriaceous, strongly

nerved, elliptic-ovate, acute, slightly narrowed to the base, sub-terminal; length 4 to 7 in., breadth 1·35 to 2 in. *Racemes* from the upper nodes either of the leafy or leafless stems, pendulous, 8- to 10-flowered, crowded, 3 or 4 in. long. *Flowers* ·75 to 1 in. in diameter; *floral bract* minute. *Sepals* oblong, sub-acute. *Petals* broader, concave, obtuse. *Lip* sub-orbicular (when spread out) with a cuneate base and a short claw, concave, the apex irregularly and minutely lobed or sub-entire and emarginate, its upper surface smooth in the middle, with some radiating deeply-coloured striæ near the base, the anterior part with a broad pubescent belt round the edge. *Column* short and broad, with a transverse concavity near its lower end. *Mentum* very short, blunt. *Anther* conical; *pollinia* narrow, elongate. Bot. Mag., t. 6962; Veitch Man. Dendrob. 76; Rolfe in Gard. Chron. 1887, I, 607; Hook. fil. Fl. Br. Ind. V, 749.

Sikkim; common in tropical valleys; Pantling No. 138; in flower during April and May. Khasia Hills, Assam.

The sepals and petals are of rather a dingy yellow, with lines of a darker shade. The lip is orange-yellow with two patches of brown nerves near the base. All the colours are dingy and the flowers are not attractive.

PLATE 78.—*Dendrobium sulcatum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 lip, 3 column and its foot, the anther *in situ*, 4 the anther, *seen from the side*, 5 pollinia; *all enlarged*.

26. DENDROBIUM DENSIFLORUM, Wall. Cat. 2000.

Stems clavate, terete or obscurely 4-angled, erect, slightly swollen at the nodes, 12 to 18 in. long. *Leaves* coriaceous, oblong-lanceolate to ovate-lanceolate, collected near the apex of the stem, acute, slightly narrowed to the base; length 4 to 6 in., breadth 1 to 2 in. *Racemes* 6 to 10 in. long, pendulous, with many densely crowded flowers; the *peduncle* stout, short, with large sheathing bracts at its base. *Flowers* membranous in texture, 1 to 1·5 in. across; *floral bract* very large, oblong, nerved, membranous, covering the bud, revolute. *Sepals* ovate-elliptic, obtuse, concave. *Petals* broader than the sepals, ovate-orbicular, the edge slightly erose. *Lip* orbicular-rhomboid, convolute in its basal half, the apical half spreading, the whole of the upper surface pubescent, the edges slightly revolute and shortly fimbriate, the base abruptly narrowed to a short straight claw. *Column* broad, with a concavity at its base. *Mentum* large, sub-globose. *Anther* conical; *pollinia* elongate. *Capsule* fusiform, 1·75 to 2·25 in. long. Lindl. in Wall. Pl. As. Rar. I, 34, t. 40; Gen. and Spec. Orch., 90; Bot. Reg. t. 1828; in Journ. Linn. Soc. III, 7; Paxt. Mag. Bot. V, t. 121; Bot. Mag., t. 3418; Hook. fil. Fl. Br. Ind. V, 748; Fl. des Serres, t. 1397; Veitch Man. Dendrob., 80, *with fig.* *D. thyrsiflorum*, Reichb. fil. in Ill. Hortic. XXII, t. 207; Veitch Man. Dendrob. 80, *with fig.*; Gard. Chron. 1877, I, 653, fig. 105. *Epidendrum Dumsattei*, Herb. Herm. (*fide* Hooker).

Sikkim; common in tropical valleys, ascending to 4,000 feet; Pantling No. 119; in flower during April and May. Westward to Nepal and eastward to the Khasia Hills; also in the hill ranges of Burmah.

The sepals and petals of this beautiful species, as it occurs in Sikkim, are invariably of a pale yellow, the lip being of a rich orange-yellow colour, paler towards the margins. The unexpanded racemes have a curious cone-like appearance, which

occurs in no other *Dendrobium*. This is caused by the flower-buds being completely enveloped in and concealed by the large imbricate delicate yellow floral bracts. There is considerable variation in other provinces in the size of the flowers and in their colouring; and this has given origin to several varietal names, such as *albo-lutea*, *Schrœderi* and *Walkeriana*. The most notable variety is the one which was separated as a species by Reichenbach under the name *D. thyrsiflorum*. The structure of the flowers in that form is, however, exactly that of typical *D. densiflorum;* but the sepals, instead of being pale yellow, are white suffused with pale lilac, the lip being yellow as usual. *D. thyrsiflorum* has also more slender stems, and the floral bracts are much narrower than in typical *D. densiflorum*.

PLATE 79.—*Dendrobium densiflorum*, Wall. Flowering plant, *of natural size*. Fig. 1 base of the lip showing the claw, 2 column and its foot, the anther *in situ*, 3 a piece of the anterior margin of the lip, 4 anther, *seen from the side*, 5 pollinia; *all enlarged*.

27. DENDROBIUM FARMERI, Paxt. Mag. Bot. XV (with fig.); Fl. Gard. III, p. 104, No. 579.

Stems clavate, boldly 4- 5-angled, erect; the base slender, the upper part from ·75 to 1 in. in diameter; length 6 to 12 or even 18 in. *Leaves* two or three, sub-terminal, coriaceous, ovate-lanceolate or elliptic-lanceolate, acute, the base slightly narrowed; length 3·5 to 8 in., breadth 1·2 to 2·2 in. *Raceme* sub-terminal, decurved and pendulous, much longer than the leaves, laxly many-flowered; the *peduncle* with imbricate bracts at the base and several scattered below the flowers. *Flowers* 2 in. across; *floral bract* broad, ·25 to ·3 in. long, very much shorter than the stalk of the ovary. *Sepals* ovate-oblong. *Petals* much broader than the sepals. *Lip* orbicular with lateral inflexed folds, pubescent, the margin erose, the base shortly clawed. *Column* short, its foot also short; *mentum* short, rounded. Walp. Ann. VI, 306; Flores des Serres, VII, t. 741; Jennings' Orchids, t. XXIV; Veitch Man. Dendrob. 42, *with fig.*; Hook. fil. Fl. Br. Ind. V, 750. *D. palpebrae*, Ann. Bot. Gard. Calc., Vol. V, pt. 1, t. 22. *D. densiflorum*, var. *alba*, Regel Garten-flora, t. 595; var. *Farmeri*, Regel, Garten-flora, t. 788; var. *albo-lutea*, Bot. Mag., t. 5780. *D. thyrsiflorum*, Regel, Garten-flora, t. 1021.

Sikkim; at elevations of from 1,000 to 3,000 feet, Pantling No. 116; in flower during April and May. Also along the base of the outer range, on sál trees. Westward to Nepal and eastwards to Assam and the Khasia Hills; also in Burmah.

In Sikkim the colouring of the flowers in this species is pretty constant. The sepals and petals when they first expand are of a pale mauve which gradually changes, in the course of a few days, to pure white. The lip is always of a deep rich yellow, paling towards the margins, and the actual margin is usually white. To this change of colour in the same individual flower is no doubt due much of the confusion which has occurred as regards the identity of this plant; individuals in the stage in which the sepals and petals are white having been mistaken for *D. thyrsiflorum*, Reichb. fil.—a Burmese plant which appears to be a form of *D. densiflorum*, of which it has the cone-shaped raceme (while in bud), and the very large convolute floral bracts, but differing in having more slender, less boldly-angled, stems, and a white perianth with a yellow lip. *D. Farmeri* has also been confused with the closely allied *D. palpebrae*, Lindl. (also a Burmese species), described in Paxt. Fl. Gard. I, 48, and in Veitch Man.

Dendrob. 67. True *D. palpebrae* is a smaller plant than *D. Farmeri*, with thinner less clavate stems. In it the lip is trowel-shaped and there is an elongated callus, 2-lobed and ciliate at the base, which runs along the centre of the lower half of the lip; the sides of the lip are also much ciliate (hence the specific name); the petals are slightly narrower and more acute than those of *D. Farmeri*. The colour of the sepals and petals of *D. palpebrae* is white, and that of the lip yellow.

There is, however, a form of *D. Farmeri* in Burma in which the sepals and petals, as well as the lip, are always yellow, and which was considered on its first discovery to be closely allied to *D. chrysotoxum*. To this the varietal name *aureo-flava* has been given. There is also in Burmah a form with smaller flowers than those of typical *D. Farmeri*, and to this Regel has given the varietal name *parviflora*. The synonymy of these stands thus:—

Var. *parviflora*, Regel, Garten-flora XXIII, 67; *D. Farmeri*, Bot. Mag., t. 4659; flowers smaller than in the type; originally sent to England by Dr. McLelland from the Bot. Gard., Calcutta, and almost certainly a native of Burmah.

Var. *aureo-flava*, Hook. fil. Bot. Mag., t. 5451; whole flower yellow; from Burmah.

PLATE 80.—*Dendrobium Farmeri*, Paxt. A flowering plant. Fig. 1 petals, *of natural size*, 2 lip, 3 base of lip, 4 column and foot with anther, 5 pollinia; *all enlarged*.

28. DENDROBIUM GIBSONII, Lindl. in Paxt. Mag. Bot. V, 169.

Stems as thick as a swan's quill at the base, tapering upwards, slightly thickened at the nodes, vertically ribbed, 2 to 3 feet long. *Leaves* ovate-lanceolate, shortly acuminate, the base rounded; length 4 to 6 in., breadth 1 to nearly 2 in. *Racemes* from opposite the bases of fallen leaves, pendulous, 6 to 8 in. long, lax, 6- to 14-flowered, with a few tubular sheaths at the base. *Flowers* 1·25 to 1·5 in. across; *floral bract* tubular, short. *Sepals* subequal, broadly ovate, blunt. *Petals* like the sepals, but slightly broader. *Lip* orbicular-reniform, the apex very broad, the margins sub-fimbriate, the upper surface papillose; the base narrowed to a short claw, entire. *Column* short, broad, its foot about equal to it in length; nectary large, with two globose calli on its extreme margin. Walp. Ann. VI, 293; Veitch Man. Dendrob. 47; Hook. fil. Fl. Br. Ind. V, 746. *D. fuscatum*, Lindl. in Journ. Linn. Soc. III, 8; Bot. Mag., t. 6226; Paxt. Fl. Garden, Vol. II, 406 (fig. 204).

Sikkim; at elevations of from 2,000 to 5,000 feet; not uncommon; Hooker and other collectors; Pantling No. 334; flowering during July and August. Assam, Khasia Hills, Burmah.

The flowers of this are of a dull dusky yellow, the lip having two round brownish-purple spots.

PLATE 81.—*Dendrobium Gibsonii*, Lindl. Parts of leafy and flowering stems, *of natural size*. Fig. 1 base of the lip, *showing the claw*, 2 a piece of the edge and upper surface of the lip, 3 column and its foot, the anther *in situ*, 4 anther, *seen from the side*, 5 pollinia; *all enlarged*.

29. DENDROBIUM FIMBRIATUM, Hook. Exot. Flora, t. 71, var. *oculata*, Hook. Bot. Mag., t. 4160.

Stems thickest at the base and tapering upwards, sub-erect, sulcate, slightly thickened at the nodes, 2·5 to 5 feet long. *Leaves* oblong-lanceolate, acuminate, 3·5 to 6

in. long, narrowed to the base; length 3·5 to 5 in., breadth ·6 to 1·1 in. *Racemes* usually on the leafy stems, lateral, pendulous, 7- to 12-flowered, 6 to 8 in. long; the *peduncle* with several sheathing bracts at the base. *Flowers* 2 to 3 in. across, yellow; *floral bract* minute. *Sepals* broadly oblong, blunt, entire. *Petals* broader than the sepals, the apices slightly emarginate, erose. *Lip* orbicular, undulate, fringed, the base shortly clawed. *Column* and its foot short, broad, the former with a sub-orbicular nectary near its lower end. *Anther* obliquely and bluntly conical; *pollinia* compressed. Wall. Cat. 2011; Lindl. Gen. and Spec. Orchid., 83 (not 76); Paxt. Mag. II, 172; Paxt. Fl. Gard. III, t. 84; Veitch Man. Dendrob. 42, *with fig.*; Warner Select Orchids, Ser. 2, t. 19; Walp. Ann. VI, 293; Hook. fil. Fl. Br. Ind. V, 745. *Dendrob. sp.* Griff. Notul. III, 113.

Sikkim; in tropical valleys ascending to 4,500 feet; common; Pantling No. 360. Westward to Kamaon and eastward to Bhotan, the Assam and Khasia Hills, and to Chittagong and Upper Burmah; also in Perak. In flower from March to May.

The flowers are of a brilliant yellow colour, and in this variety (*oculata*) there is a large orbicular patch of rich reddish-brown on the lip. The flower in the typical form has no such spot and must be therefore much less handsome. It does not occur in Sikkim. We have never seen a specimen of it living or dead, and are inclined to doubt its occurrence in the Eastern Himalaya.

PLATE 82.—*Dendrobium fimbriatum*, Lindl., var. *oculata*, Hook. A raceme and part of a stem, *of natural size*; an entire plant, *much reduced in size*. Fig. 1 base of the lip showing the short claw, 2 a portion of the edge of the lip showing the fimbriation, 3 column and its foot, the anther *in situ*, 4 anther, *seen from the side*, 5 pollinia; *all enlarged*.

30. DENDROBIUM HOOKERIANUM, Lindl. in Journ. Linn. Soc. III, 8.

Stems about as thick as a quill between the nodes, but much thicker at the nodes, 6 to 8 feet. long, pendulous. *Leaves* oblong-lanceolate, the apex acute, slightly narrowed to the stem-clasping base; length 3 to 4 in., breadth ·85 to 1·15 in. *Racemes* from the leafy stem, 4 to 6 in. long and 2- to 4-flowered, pendulous. *Flowers* 3 to 4 in. in diameter; *floral bract* very short. *Sepals* subequal, elliptic-oblong, sub-acute. *Petals* broader, denticulate. *Lip* orbicular, the margin deeply fringed, the base slightly cuneate. *Column* short and broad; the nectary at its lower end with two small calli below it. *Mentum* short, broad, rounded. *Anther* conical, 3-lobed. Bot. Mag. 6013; Reichb. fil. in Gard. Chron. 1857, 616; Veitch Man. Dendrob. 49; Hook. fil. Fl. Br. Ind. V, 745. *D. chrysotis*, Reichb. fil. in Gard. Chron. 1870, 1311; Ill. Hortic. 1873, t. 155; Warner Sel. Orchid. Ser. 3, t. 6.

Sikkim; at elevations of from 4,000 to 6,000 feet; Pantling No. 296; flowering in September. Assam and Khasia Hills.

The flowers are of a rich golden-yellow, the lip having two oblique oval patches of dark purple on its disc. A variety without blotches on the lip is not uncommon.

PLATE 83.—*Dendrobium Hookerianum*, Lindl. Part of stem with leaves and raceme, *of natural size*. Fig. 1 column and its foot and the anther, 2 a piece of the lip to show the fringing of its edge, 3 anther, *as seen from the side*, 4 pollinia; *all enlarged*.

31. Dendrobium moschatum, Wall. in Don Prod. (1825), 34.

Stems tufted, stout, terete, striate, ·5 in. thick about the middle, and 3 to 6 feet long, erect. *Leaves* oblong, ovate-oblong or lanceolate, acute or minutely and obliquely notched, slightly narrowed to the base; length 3 to 6 in., breadth 1·25 to 2 in. *Racemes* one or two from a node very near the apex of a leafless or leafy stem, 9 to 15 in. long, deflexed, laxly 8- to 16-flowered; base of the peduncle stout and covered with many sheathing imbricate bracts. *Flowers* 2 to 3 in. across; *floral bract* lanceolate. *Sepals* subequal, oblong-elliptic, sheathing, often 2 in. long, obtuse. *Petals* larger than the sepals, broadly ovate, obtuse. *Lip* shorter than the petals, forming a sub-globular or pyriform open-mouthed pouch, the margins incurved, the outer surface and the edges pubescent. *Column* short, broad, its foot widening downwards; nectary transversely oblong. *Anther* with an erose lip. *Capsule* fusiform, 2 in. long. Wall. Pl. As. Rar. II, 83, t. 195; Lindl. Gen. and Spec. Orchid., 82; in Bot. Reg. 1844, Misc. 37; in Journ. Linn. Soc. III, 8; Bot. Mag. t. 3337; Paxt. Mag. II, t. 211 (*excl. syn. clavatum*); Veitch Man. Dendrob. 61; Warner Orch. Alb., t. 165 (var. *cupreum*); Walp. Ann. VI, 296. *D. calceolaria*, Carey in Hook. Exot. Flora, t. 184; Lindl. Gen. and Spec. Orchid., 83; Hook. fil. Fl. Br. Ind. V, 744. *D. cupreum*, Herb. in Bot. Reg., t. 1779. *Epidendrum moschatum*, Ham. in Syme's Embassy to Ava, ed. 1 (1800), p. 478, *with fig.*; ed. 2, vol. III, 315, *with fig.*

Sikkim; in tropical valleys ascending to 4,000 feet; Pantling No. 370. Westward to Kamaon and eastward to Bhotan, Assam and the Khasia Hills; also in Chittagong and Tenasserim; flowering from May to July.

The coloration of the flowers of this species is variable; but as a rule, in the Sikkim specimens, the sepals and petals are ochraceous with reddish tips and with reddish or orange veins. The lip is also ochraceous, but has two large brownish-purple spots inside its cup. The column is yellow and the anther purple. The odour is sweetish with a soupcon of rhubarb or musk. In other provinces the ochraceous colour in the flowers is replaced by white or by golden yellow, and the lip is not blotched with purple. The earliest name of this is undoubtedly *Epipendrum moschatum*, and it was published in the year 1800 in the first edition of Syme's Embassy to Ava. The name was repeated in the much later second edition of the same work. Wallich's name, *Dendrobium moschatum*, dates from 1825; whereas Carey's name, *D. calceolaria*, was not published until 1827.

Plate 84.—*Dendrobium moschatum*, Wall. Raceme of flowers and leaf with part of stem, *of natural size*. An entire plant, much reduced in size. Fig. 1 column with its foot and anther *in situ*, 2 anther, *inside view*, 3 pollinia; *all enlarged*.

32. Dendrobium aggregatum, Roxb. Fl. Ind. III, 177, var. *Jenkinsii*, K. and P.

Pseudo-bulbs fusiform or oblong-compressed, 1 to 1·5 or 2 in. long, angled. *Leaf* coriaceous, solitary from the apex of the pseudo-bulb, oblong, obtuse and notched at the apex, narrowed at the base to a short petiole; length ·75 to 2·5 in., breadth ·4 to ·6 in. *Flowers* in a 2- to 3- to many-flowered drooping raceme from the axil of a small scale, from 1 to 1·25 in. across, the stalked ovaries longer than the leaves. *Sepals* small,

ovate, obtuse, spreading, subequal. *Petals* much broader than the sepals, ovate with a cuneate base. *Lip* much larger than the sepals and petals, tranversely oblong from a contracted shortly-clawed sub-convolute base; the apex very broad, emarginate, entire, shortly and irregularly ciliolate; the disc concave, pubescent. *Column* broad. *Anther* 4-ridged on the summit; the nectary at the end of the foot oblong; the lower edge of the *stigma* emarginate and the upper with two small globose calli at its corners. *Capsule* fusiform, 3 or 4 in. long. Lindl. in Wall. Cat. 7411A.; in Bot. Reg., t. 1695; Bot. Mag., t. 3643; Paxt. Mag. Bot. VI, t. 145; Walp. Ann. VI, 306; Veitch Man. Dendrob. 15; Hook. fil. Fl. Br. Ind. V, 750. *D. Lindleyi*, Steudel Nomenc. I, 490. *D. Jenkinsii*, Wall. in Bot. Reg. 1839, t. 37; Warner Sel. Orch. II, t. 23; Veitch Man. Dend. l. c. 50; Walp. Ann. VI, 307.

Common along the base of the Sikkim-Himalaya; Pantling No. 262; flowering from March to May. Assam, Chittagong, Burma and Perak; at the base of hill ranges. Distrib. Southern China.

The flowers of typical *D. aggregatum* on first expansion are primrose yellow; but the colour deepens into orange, the lip having a dark patch near its base. The specific name *D. Jenkinsii* was given by Wallich to the form in which the pseudo-bulbs are very short and the flowers are either solitary or in a 2-flowered raceme. This form has, however, been repeatedly found growing in the same clumps with plants having pseudo-bulbs of the ordinary length, and such as are found in typical *D. aggregatum*. We retain it as a variety, although it hardly deserves even varietal rank.

PLATE 85.—*Dendrobium aggregatum*, Roxb., var. *Jenkinsii*, K. and P. A plant, *of natural size*. Fig. 1 a flower with its stalked ovary and basal bract, 2 the base of the lip, 3 part of the margin of the lip to show the irregular ciliæ, 4 column and its foot, the anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

33. DENDROBIUM MACRAEI, Lindl. Gen. and Spec. Orchid., 75; in Journ. Linn. Soc. III, 6.

Rhizome creeping, annulate, emitting pendulous polished stems 2 or 3 feet long and about ·25 in. thick, bearing at irregular intervals narrowly fusiform, somewhat compressed, shining pseudo-bulbs 2 to 2·5 in. long. *Leaf* terminal, sessile, solitary, linear-oblong, sub-acute, 4 to 8 in. long and ·75 to 1 in. in breadth. *Flowers* one or two from near the base of a leaf, ·75 to 1 in. across; bracts at the base of the pedicel about two; *floral bract* proper, minute, much shorter than the stalked ovary. *Sepals* elliptic-oblong, sub-acute, spreading. *Petals* narrower than the sepals. *Lip* in general outline oblong-obovate, decurved about the middle, concave; the side lobes oblong with truncate erose apices, the disc between them with two fleshy sinuous crests; middle lobe contracted and coarsely erose-crisped at its base, its terminal part expanded and the edges much plicate. *Column* short, spotted, its foot short; *mentum* short, broad, conical; lip of anther minutely denticulate; *pollinia* narrowly oblong. Thwaites' Enum. Pl. Cey. 297; Dalz. and Gibs. Fl. Bomb., 260; Hook. fil. Fl. Br. Ind. V, 714. *D. fimbriatum*, Lindl. Gen. and Spec. Orch., 76 (*not of Hooker*). *D. plicatile*, Lindl. in Bot. Reg. 1840, Misc. 10. *D. nodosum*, Dalz. in Hook. Journ. Bot. IV (1852), 292. *D. Rubani*, Lindl. in Journ. Linn. Soc. Lond. III, 7. *D. pardalinum*, Reichb. fil. in Gard. Chron. 1885, II, 230. *D. Flabellum*, Reichb. fil. in Bonplandia, 1857, 56; Xenia Orchidacea, II, t. 118. *Desmotrichum fimbriatum*, Blume Bijdr. 329.

Sikkim; common in tropical valleys; in flower during May; Pantling No. 266. Khasia Hills, Upper Burmah, Java; the Nilgiri Hills and Western Ghâts in Southern India; also in Ceylon.

The difficulty of understanding the structure of the lip from an examination of dried specimens no doubt in part accounts for the number of names which have been given to this species. The foregoing synonymy has, with the exception of *D. plicatile*, been taken verbatim from Sir Joseph Hooker's "Flora of British India"; and for the latter synonym we are also indebted to Sir Joseph. The flowers of this are white, the side lobes of the lip and the column being pink with purple spots; the apex of the lip is pale green.

PLATE 86.—*Dendrobium Macraei*, Lindl. Part of a plant, *of natural size*. Fig. 1 flower, *front view*, 2 bract, stalked ovary, column and lip, *seen from the side*; 3 lip, *upper surface*, 4 column and its foot and the anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

34. DENDROBIUM ROTUNDATUM, Benth. in Benth. and Hook. fil. Gen. Plantar., III, 499.

Rhizome pendulous, woody, ·2 in. thick, sheathed, bearing narrowly ellipsoid or ovoid pseudo-bulbs 3 or 4 in. apart, 1 to 1·5 in. long, each partly covered by scarious sheaths. *Leaves* two, elliptic-oblong, sessile or shortly petioled, notched at the apex; length 2·5 to 4 in., breadth 1 to 1·25 in. *Flowers* 1·5 in. across; *floral bracts* membranous, often nearly as long as the stalked ovary. *Sepals* ovate-lanceolate, spreading; the lateral pair falcate, rather fleshy. *Petals* somewhat smaller than the sepals. *Lip* obovate-oblong in general outline, sessile; the side lobes rounded, the disc between them with three unequal lamellæ; the anterior lobe sub-reniform, its edges thin and undulate, its upper surface with a large triangular fleshy thickening. *Column* wide at the lower end, broadly winged. *Sarcopodium rotundatum*, Lindl. Fol. Orchid., Sarcopodium, 2; Hook. fil. Fl. Br. Ind. V, 712. *Bolbophyllum rotundatum*, Reichb. fil. in Walp. Ann. VI, 244.

Sikkim; at elevations of from 6,000 to 7,000 feet; Griffith, Hooker, Lister, Gamble and others; Pantling No. 69. Naga Hills, Prain; in flower during April.

The flowers are of a pale chestnut brown. The rhizomes are pendent. Its nearest ally is *D. fuscescens*, Lindl., from which this differs in having broader leaves and much shorter pedicellate ovaries, broader petals, and a lip with a smaller anterior lobe.

PLATE 87.—*Dendrobium rotundatum*, Benth. Terminal part of a plant, *of natural size*. Fig. 1 a flower with its stalked ovary and floral bract, *of natural size*, 2 column and lip, *seen from the side*, 3 lip showing the lamellæ on its basal part and the triangular thickened area on its anterior lobe, *seen from above*, 4 transverse section of the lip near the base, showing the three lamellæ, 5 column showing the winged edges, 6 anther, 7 pollinia; *all enlarged*.

35. DENDROBIUM FUSCESCENS, Griff. Notul. III, 308; Ic. Pl. Asiat., t. 309.

Rhizome ·125 in. thick, branching, bearing several inches apart narrowly ovoid pseudo-bulbs 1 in. long, each clothed with several tightly-fitting sheaths. *Leaves* two, narrowly oblong-lanceolate, tapering to each end, sessile or sub-sessile, notched at the apex,

1·75 to 4 in. long and ·5 to ·75 in. broad. *Flowers* about 1·5 in. across, purplish-brown; bracts at the base of the long-pedicelled ovary ovate-lanceolate, scarious, imbricate, varying in size. *Sepals* ovate-lanceolate, acuminate. *Petals* much narrower than the sepals, but about equal in length. *Lip* obovate-oblong, sessile, the basal lobes oblong, sub-falcate, obtuse, the disc between them with three parallel lamellæ; anterior lobe orbicular-ovate, entire or slightly undulate at the apex, its upper surface with a broad central smooth slightly thickened line and branching lateral nerves. *Column* narrow, wingless; the foot very long, blunt. Hook. fil. Fl. Br. Ind. V, 712. *Sarcopodium fuscescens*, Lindl. in Paxt. Fl. Gard. I, 155; Fol. Orchid., Sarcopodium 2. *Bolbophyllum fuscescens*, Reichb. fil. in Walp. Ann. VI, 244.

Sikkim-Himalaya; at elevations of 5,000 to 7,000 feet; Clarke, G. Gammie, Pantling No. 11; in flower in October. Khasia Hills; Griffith, Hooker, Clarke, Mann. Naga Hills; Prain.

This species has smaller flowers than the last. The sepals and petals are of a dull greyish-brown colour, the lip paler and with a small central patch of yellow, the foot of the column being deep purple.

PLATE 88.—*Dendrobium fuscescens*, Griff. Part of a plant, *of natural size*; Fig. 1 floral bract, stalked ovary, column and lip, *seen from the side*, 2 lip, 3 column and its foot, 4 view of inside of an empty anther, 5 pollinia; *all enlarged.*

36. DENDROBIUM AMPLUM, Lindl. in Wall. Cat. 2001; Gen. and Spec. Orchid., 74.

Rhizome pendulous, ·25 in. thick, woody, sheathed, bearing at distances of four or five inches ellipsoidal or oblong pseudo-bulbs 1 to 2 in. long, half covered by large scarious sheaths. *Leaves* two, oblong or elliptic-oblong, acute, shortly petioled, 4 to 6 in. long, 1·5 to nearly 2 in. broad; petiole ·5 to 1 in. *Flowers* 3·5 in. across; bracts at the base of the stalked ovary large, loose, scarious, often 1·5 in. long. *Sepals* lanceolate with broad bases, acuminate, the lateral pair slightly falcate. *Petals* linear, wide-spreading like the sepals. *Lip* articulate, mobile, 3-lobed; the side lobes short, rounded; the middle lobe rhomboid, sub-acute, entire, with three parallel mesial ridges and strong branching nerves; the space between the side lobes (the disc) with three lamellæ, the outer two having an erect tooth at their bases; the middle one shorter and toothless. *Column* straight; its foot at a right angle to itself, with thickened sides and a nectar-secreting depression just above the junction with the lip. Wall. Pl. As. Rar. I, 25, t. 29; Paxt. Mag. Bot., t. 121; Griff. Notul. III, 307; Ic. Pl. As., t. 304; Hook. fil. Fl. Br. Ind. V, 711. *Sarcopodium amplum*, Lindl. in Paxt. Fl. Gard. I, p. 155; Fol. Orchid., Sarcopodium 1. *Bolbophyllum amplum*, Reichb. fil. in. Walp. Ann. VI, 244.

Sikkim; at elevations of 4,000 to 6,000 feet; Clarke, King, Pantling No. 246; in flower during October. Nepal; Wallich. Assam and the Khasia Hills.

The sepals and petals are of a pale greenish-brown colour, profusely spotted and blotched with darker brown; the terminal lobe of the lip of a dark purple with bronze edges; the foot of the column is spotted with purple.

PLATE 89.—*Dendrobium amplum*, Lindl. Part of a plant, *of natural size*. Fig. 1 longitudinal section of the basal half of the lip, showing one of the outer lamellæ and the tooth-like process at its base, 2 column and its foot, 3 anther as seen from behind, 4 pollinia; *all enlarged.*

6. Bulbophyllum, Thouars.

Epiphytal; *pseudo-bulbs* from a creeping rhizome (sometimes absent). *Leaves* solitary, thick and persistent (deciduous in *B. polyrhizum*); or in pairs and thin and deciduous. *Scape* from the rhizome near the base of the pseudo-bulb, rarely distant from it. *Flowers* solitary, capitate, umbellate, spicate or racemose. *Sepals* subequal, or the lateral pair longer than the dorsal (rarely twice as long); the lateral pair adnate to the foot of the column. *Petals* various, usually much smaller than the dorsal sepal. *Lip* jointed on the foot of the column, mobile, usually small and strongly recurved. *Column* very short, often 2-aristate or toothed at the apex. *Anther* 2-celled; *pollinia* four, the two inner reduced in size. A genus of about 250 species, tropical and sub-tropical, chiefly Asiatic; a few African, Australian and American.

Flower solitary from near the base of a pseudo-bulb, minute, sessile . . *1. B. Listeri.*
Flowers solitary or two or three from near the base of a pseudo-bulb, large (·5 to ·75 in. long), on long pedicels.
Leaves 1·5 to 2 in. long; sepals and petals striped; pseudo-bulbs ovoid, compressed . . . . . *2. B. Griffithii.*
Leaves 3 to 6 or 7 in. long.
Sepals and petals striped; pseudo-bulbs cylindric . . . . . *3. B. affine.*
Sepals and petals spotted; pseudo-bulbs obpyriform . . . . . *4. B. leopardinum.*
Flowers in racemes, umbels or heads.
* Lateral sepals broad, not acuminate.
Flowers in racemes.
Flowers yellow or ochraceous (slightly spotted and streaked with purple in *B. conchiferum*).
Petals erose-dentate, lateral sepals falcate, diverging; pedicel of ovary long . . . . . *5. B. gymnopus.*
Petals entire.
Lateral sepals cohering; ovary sessile . . . *6. B. rigidum.*
Lateral sepals free, spreading; ovary shortly stalked . . . . . *7. B. polyrhizum.*
Flowers dark-coloured, either purple or brown (green with purple streaks in *B. striatum*, or partly green and yellow, as in *B. cornu-cervi*).
Racemes decurved, densely-flowered; lateral sepals cohering; leaves and flowers contemporaneous.
Lip entire; pseudo-bulbs none . . . . . *8. B. cylindraceum.*
Lip with lateral lobes; pseudo-bulbs more or less ovoid . . . . . *9. B. Careyanum.*
Racemes drooping, rather laxly-flowered; pseudo-bulbs turbinate; leaves two, not contemporaneous with the flowers . . . . . *10. B. triste.*
Scapes pendulous from the base; petals spurred; lateral sepals cohering, their apices acuminately beaked . . *11. B. bisetum.*
Racemes erect; lateral sepals not cohering.
Columnar teeth lobed and horn-like; flowers with green and yellow markings; petals not ciliate; pseudo-bulbs minute, fusiform; rhizome none . . *12. B. cornu-cervi.*
Columnar teeth minute, triangular; flowers purple with paler markings; petals ciliate; pseudo-bulbs turbinate; rhizome slender . . . . . *13. B. secundum.*

Column not toothed; flowers green with purple stripes; petals not ciliate; pseudo-bulbs broadly ovoid . . . *14. B. striatum.*

Column not toothed; sepals and petals hyaline; pseudo-bulbs none; racemes with two or sometimes only one flower . . . . . *15. B. hymenanthum.*

Flowers in dense heads, minute.

Pseudo-bulbs globose; leaves linear-oblong; rhizome none . . *16. B. piluliferum.*

Pseudo-bulbs none; leaves oblanceolate . . . . . *17. B. gracilipes.*

* * Lateral sepals spreading, acuminate, the bases broad; flowers variously coloured; the lip always more or less purple.

Flowers in racemes; lip without capitate hairs.

Pseudo-bulbs distant on a thin rhizome . . . . . *18. B. reptans.*

Pseudo-bulbs crowded, cylindric, 1·25 to 3 in. long; rhizome none; lip shorter than the petals, the edge shortly ciliolate near the base . . . . . *19. B. eublepharum.*

Pseudo-bulbs crowded, ovoid, ·75 to 1 in. long; rhizome stout; lip much longer than the petals, as long as the lateral sepals, bearded . . . . . *20. B. Penicillium.*

Flowers in heads; centre of lip excavated and filled with capitate spreading hairs . . . . . *21. B. odoratissimum.*

* * * Sepals all caudate-acuminate, the lateral pair narrow; flowers white, greenish-white or pale yellow.

Flowers in umbels.

Pseudo-bulbs oblique; petals elongate, acute; teeth of column very long, slender.

Leaves 2 to 4 in.; pseudo-bulbs 1 to 1·75 in. long; flowers greenish . . . . . *22. B. cauliflorum.*

Leaves 1·5 to 2 in.; pseudo-bulbs ·6 to ·8 in. long; flowers tinged with orange-yellow; floral bract very short; lip grooved to nearly the apex . . . . . *23. B. protractum.*

Pseudo-bulbs erect; petals ovate or oblong, usually blunt.

Petals ovate, lip grooved; teeth of column short, triangular; floral bract as long as the ovary, acuminate; pseudo-bulbs 1 to 1·25 in. long . . . *24. B. leptanthum.*

Petals oblong-lanceolate; lip ridged; teeth of column acuminate; floral bract not acuminate; pseudo-bulb ·5 to ·65 in. long . . . . . *25. B. Gamblei.*

Petals broadly ovate, acute, 3-nerved; lip not grooved to the apex; teeth of column long, subulate, curved; floral bract half as long as the ovary, sub-acute; pseudo-bulbs ·4 in. long . . . . . *26. B. Clarkeanum.*

Flowers in racemes.

Raceme with its peduncle shorter than the leaf; pseudo-bulbs none . . . . . *27. B. ebulbum.*

Raceme with its peduncle longer than the leaf.

Racemes erect, glabrous; pseudo-bulbs depressed-turbinate, distant . . . . . *28. B. Thomsoni.*

Racemes drooping, pubescent; pseudo-bulbs ovoid, crowded . . . . . *29. B. hirtum.*

1. BULBOPHYLLUM LISTERI, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, 334.

Rhizome none; *pseudo-bulbs* narrowly ovoid, compressed, ·3 in. long, obliquely and alternately arranged and sub-imbricate. *Leaf* linear-oblong, tapering to each end, sessile, fleshy, 1 to 1·25 in. long and ·15 to ·2 in. broad. *Flowers* solitary, on very short pedicels from the bases of both old and new pseudo-bulbs, and much shorter than the latter; the stalked ovary proceeding from the short pedicel and partly enclosed in its three or four sheathing shrivelled bracts; the *floral bract* proper lanceolote, acuminate, longer than the ovary. *Flowers* about ·15 in. long. *Sepals* unequal, and with ciliolate margins; the dorsal ovate-lanceolate, blunt, spreading; the lateral pair slightly longer and with obliquely truncate apices cohering by their inner margins nearly to the tips, and forming a kind of trough in which the lip lies. *Petals* broadly ovate, with obtuse erose apices; the middle third of the side minutely ciliolate. *Lip* oblong-lanceolate, stipitate, slightly deflexed from the base, flat, not tumid; the upper surface with a central thickened line throughout its entire length; the edges ciliolate almost from the base to near the blunt apex. *Column* very short; its apical processes long and falcately curved upwards; the *mentum* very little curved. *Anther* galeate and with a filiform attachment to the column; *pollinia* unequal, the outer two elliptic, curved, the inner very small.

British Bhotan, at the Rumpti Lake, some miles from the Sikkim frontier, elevation about 1,000 feet; Pantling No. 113; flowering in March.

This remarkable species was discovered by Mr. J. L. Lister of the Bhotan Cinchona Association, and at one time Curator of the Botanic Garden, Calcutta, who gave it to Mr. Pantling. It is one of the most curious of the whole genus. The flowers are of a dull lake colour.

PLATE 90.—*Bulbophyllum Listeri*, King and Pantling. Two plants, *of natural size*. Fig. 1 a flower, 2 pedicel with its sheaths, floral bract proper, stalked ovary, column with the anther *in situ*, mentum and lip, *seen from the side*, 3 the petals, 4 column, showing its falcate apical processes and mentum, 5 lip, 6 anther, 7 pollinia; *all enlarged*.

2. BULBOPHYLLUM GRIFFITHII, Reichb. fil. in Walp. Ann. VI, 247.

Pseudo-bulbs coespitose, narrowly ovoid, compressed, ·6 to ·75 in. long. *Leaf* sessile, narrowly oblong, tapering slightly to the ends, deflexed more or less at a right angle to the pseudo-bulb, the apex blunt, entire, length 1·5 to 2 in., width ·4 to ·5 in. *Inflorescence*, 1-flowered; the flower about ·75 in. across; floral bract cupular, much shorter than the slender curved stalked ovary. *Sepals* sub-equal, ovate-oblong, acute. *Petals* ovate, abruptly acute, the margins near the apex minutely erose. *Lip* oblong, sub-acute, with two forward-pointing tooth-like auricles near the base and two slender crenate ridges running from these on the upper surface, but disappearing near the apex; the base delicately jointed to the much produced foot of the column. *Column* short, with broad triangular wings about the middle opposite the stigma, the apex with two small sharp teeth. *Pollinia* in two free pairs. Hook. fil. Fl. Br. Ind. V, 756. *Sarcopodium Griffithii*, Lindl. Fol. Orch. 6. *Bulbophyllum* sp. Griff. Ic. Pl. Asiat., t. 296, fig. 2 (not of Notul. and It. Notes). ? *Dendrob. bulbophylli*, Griff. It. Notes, 65, No. 1019.

Sikkim; at Lachung; elevation 9,000 feet; G. A. Gammie, No. 1005; in flower during August. Khasia Hills; Hooker and Thomson.

The flowers of this species are yellowish with reddish-brown spots. It had previously been collected only on the Khasia Hills, where it was found by Griffith and Sir Joseph Hooker in the Myrung wood at an elevation of 5,000 feet. In Sikkim it was collected in 1892 by Mr. G. A. Gammie at Lachung, at 9,000 feet. In spite of the higher elevation at which it grows in Sikkim, the Lachung plants differ from those found in Myrung only in having broader and slightly erose petals, and leaves much more attenuated at the base.

The column of this species presents a structural arrangement of the greatest interest, inasmuch as the rostellum is represented by a large ball of yellowish viscid matter, similar to that found in the column in *Cirrhopetalum guttulatum and C. ornatissimum*. But in this plant the viscid ball and the pollinia are quite free and in no way attached to each other; whereas, in the two species of *Cirrhopetalum* just referred to, they are connected and form a rudimentary appendage akin to that characteristic of *Vandeæ*.

PLATE 147.—*Bulbophyllum Griffithii*, Reichb. fil. A plant; *of natural size*. Fig. 1 a flower, 2 flowering peduncle showing the bract, stalked ovary, column and lip of its solitary flower, *from the side*, 3 lip, 4 column showing its apical and lateral teeth, anther, stigma and elongated foot, 5 anther, 6 pollinia; *all enlarged*.

3. BULBOPHYLLUM AFFINE, Lindl. in Wall. Cat. 1982; Gen. and Spec. Orchid., 48.

Rhizome long, densely-rooting, about ·2 in. thick. *Pseudo-bulbs* about 2 in. apart, cylindric, slightly thickened at the base, 1·5 to 1·75 in. long and about ·3 in. thick. *Leaf* narrowly oblong, obtuse, the base narrowed; length 3 to 7 in., breadth ·65 to 1·25 in.; *petiole* ·25 in. *Scape* very short (·25 in.) and bracteate, producing only a single flower with a pedicelled ovary 1 to 2 in. long from the sides of the base of a pseudo-bulb, or from the rhizome between the pseudo-bulbs. *Flowers* ·75 to nearly 1 in. long, pale green with purple nerves, smooth. *Sepals* subequal, lanceolate, sub-acute, 5-nerved, not reflexed, the lateral pair falcate. *Petals* rather shorter than the sepals, 3-nerved. *Lip* shorter than the petals, lanceolate, thickened and concave at the base, the margins of the upper surface dark purple. *Column* yellowish-green, rather stout, its foot short. *Anther* conical, scabrid; *pollinia* curved. Reichb. fil. in Walp. Ann. VI, 246; Hook. fil. Fl. Br. Ind. V, 756. *Sarcopodium affine*, Lindl. in Paxt. Fl. Gard. I, 155; Fol. Orchid., Sarcopodium 5.

In the valley of the Teesta, at elevations of about 2,000 feet; common; Pantling No. 154; in flower in June and July. Nepal; Wallich. Khasia Hills, at elevations up to 4,000 feet; J. D. Hooker and T. Thomson, G. Mann. Naga Hills at Kohima; D. Prain.

PLATE 91.—*Bulbophyllum affine*, Lindl. A plant, *of natural size*. Fig. 1 apex of ovary, column with its foot and the lip, *seen from the side*, 2 lip, 3 column and its foot with the anther *in situ*, 4 anther, 5 and 6 pollinia; *all enlarged*.

4. BULBOPHYLLUM LEOPARDINUM, Lindl. in Wall. Cat. 1981; Gen. and Spec. Orchid., 48.

Rhizome stout, covered with numerous fibrous sheaths. *Pseudo-bulbs* obpyriform, compressed, crowded, imbricate, smooth, 1 to 1·5 in. long. *Leaf* elliptic-oblong, the apex blunt but shortly mucronate, the base narrowed to the short petiole; blade 3

to 6 in. long and 1 to 2 in. broad; petiole about ·25 in. long. *Flowers* 1 in. in diameter, solitary or two or three from the base of a pseudo-bulb; pedicel and ovary about as long as the pseudo-bulb; *floral bract* broad, sub-spathaceous, pale, ochraceous, spotted with purple. *Sepals* ovate-lanceolate, sub-acute, 9-nerved. *Petals* smaller than the sepals, 7-nerved. *Lip* shorter than the petals, thick, decurved from below the middle, lanceolate, the base with small toothed auricles near its attachment to the apex of the much-curved foot of the column; the apex obtuse, the upper surface concave and with an elongated nectar-secreting groove expanding at its base into a triangular pit. *Anther* conical. Walp. Ann. VI, 247; Hook. fil. Fl. Br. Ind. V, 756. *Dendrobium leopardinum*, Wall. Tent. Fl. Nep., t. 28. *Sarcopodium leopardinum*, Lindl. Fol. Orch., Sarcopodium 5.

Sikkim; at elevations of 6,000 feet; not uncommon. Pantling No. 281; in flower in October and November. Nepal; Wallich. Khasia Hills; Hook. fil. and T. Thompson, G. Mann.

A handsome species not previously collected in Sikkim. The sepals and petals are whitish or pale-ochraceous, spotted with crimson; the lip is deep crimson or purple, indistinctly spotted, and the column yellow, which colour passes into purple in the mentum. The nectar, plentifully secreted by the lip, is of a pinkish colour and possesses an odour suggestive of decaying fruit, which is very attractive to flies of all kinds. Mr. Pantling has recorded the following incident, which throws some light on the fertilization of the genus generally:—"One of the many visitors to the plant on my table while I was making a drawing of it was an insect rather longer than the common house-fly, but brownish in colour and clothed with stiff hairs. One of these alighted on a flower and depressed the mobile lip to its utmost. As the fly absorbed the nectar on the anterior part of the lip it gradually approached nearer and nearer the base, seeking for more. As it got to the part of the lip which bends down to join the column, the lip began to rise, and as the latter suddenly assumed its normal position, the fly was pressed between it and the column and was for some time held a prisoner. After some struggles, it managed to escape, carrying off one of the pollinia glued to its thorax. This incident may assist to throw some light on the use of the mobility of the lip so characteristic of this genus and of *Cirrhopetalum*."

PLATE 92.—*Bulbophyllum leopardinum*, Lindl. A plant, *of natural size*. Fig. 1 scape with its bracts, pedicel and ovary, column and lip, *seen from the side*, 2 and 3 lip, *front and back views*, 4 column showing its much-curved foot, 5 anther, 6 pollinia; *all enlarged*.

5. BULBOPHYLLUM GYMNOPUS, Hook. fil. Ic. Plantar., t. 2040.

Rhizome about ·2 in. thick, very long, the apical (growing) part with spotted sheaths ·5 in. long. *Pseudo-bulbs* about 6 or 7 in. apart, ovoid, smooth, with scarious sheaths at their bases. *Leaf* narrowly oblong, the apex blunt but slightly notched, the base narrowed to the short petiole; length 5 to 7·5 in., breadth 1 to 1·25 in.; *petiole* ·5 to 1 in. *Scape* slender, sheathed at the base, erect, shorter than the leaf; the *peduncle* only about 1 in. long; the *raceme* five or six times as long, laxly-flowered; *floral bract* minute, lanceolate, much shorter than the long-stalked ovary. *Flowers* ·3 in. long, white and yellow. *Lateral sepals* inserted on the produced foot of the column and widely separated at their bases from the dorsal, falcate, acute, spreading downwards, their edges incurved; the dorsal shorter, lanceolate, acute, concave, erect. *Petals* about half

as long as the lateral sepals, linear-lanceolate, serrulate, spreading. *Lip* rather shorter than the petals, lanceolate, with a broad base, the apex acute. *Column* broad, its apical teeth short, acute, their bases broad; the foot as long as the column, sharply curved upwards at the apex. *Anther* papillose. *Pollinia* unequal, the inner two smaller. Hook. fil. Fl. Br. Ind. V, 764. *Bulbophyllum*, Griff. Notul. III, 294; Ic. Pl. Asiat., t. 297; Itin. Notes II, 104, No. 65.

Sikkim; at Rishap; Pantling No. 357. Engo; elevation 3,000 feet; in flower in November and December. Bhotan, Griffith (Kew Distrib. No. 5133). Khasia Hills; Griffith (Kew Distrib. No. 5134); at Jowai, 3,500 feet, Clarke, King's Collectors.

The insertion of the lateral sepals is at the extremity of the foot of the column, and is separated from that of the dorsal by a wide space. The same arrangement occurs in *B. Wrayi*, Hook. fil. The sepals of this are white with spots of red externally; the petals are white; the column pale-ochraceous, spotted with red in front, and the lip and anther are yellow.

PLATE 93.—*Bulbophyllum gymnopus*, Hook. fil. Part of a plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, *seen from the side*, 3 lip, 4 column with its foot and anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

6. BULBOPHYLLUM RIGIDUM, *new species*.

Rhizome about ·2 in. thick, clothed with brown fibres; *pseudo-bulbs* none. *Leaves* rising direct from the rhizome about ·5 in. apart, each with a whorl of fibres at the base of the petiole; the young leaf at flowering-time invested by a tubular sheath 2 in. long; blade oblong, blunt, narrowed at the base into the short petiole; length 6 to 10 in., breadth 1·75 to 2 in.; petiole 1 to 1·5 in. *Scape* slender, equal to or shorter than the leaf; the *peduncle* longer than the somewhat decurved spike, with one or two tubular short sheaths at intervals. *Flowers* somewhat distant, yellowish, tinged with green and streaked with red, ·3 in. long; *floral bract* triangular, acute, longer than the short sessile ovary. *Sepals* 3-nerved; the dorsal spreading, lanceolate with a broad base, sub-acuminate; the lateral pair longer, oblong, obtuse, connate below, free at the apex. *Petals* shorter than the dorsal sepal, oblong with an angularly acute erose apex, 1-nerved. *Lip* as long as the dorsal sepal, elliptic-oblong, blunt, the margins deflexed, glabrous, the base with a narrow nectar-secreting groove. *Column* broad, its apical processes broad and 3-toothed, its foot very short. *Anther* much depressed.

Sikkim; at elevations about 6,000 feet, Griffith (Kew Distrib. No. 5291); Pantling No. 42; in flower in May and June.

The spikes of this curious species open from the apex downwards, and are often bent at a right angle to the peduncle. The sepals and petals are brownish-yellow flushed with green and have purplish nerves; the lip is of the same ground colour, but towards the base has many minute purple spots; the column is greenish, spotted in front like the lip. Hitherto it has been found nowhere but in Sikkim. To this belongs the Griffithian specimen No. 5291 (Kew Distrib.), which has been inadvertently referred in the "Flora of British India" to *B. conchiferum*, Reichb. fil., a closely allied but pseudo-bulbous species inhabiting the Khasia Hills.

PLATE 94.—*Bulbophyllum rigidum*, King and Pantling. Part of a plant, *of natural size*. Fig. 1 flower, *side view*, 2 ovary, column with its foot, anther *in situ*, and lip, 3 lateral sepals, 4 petals, 5 lip, 6 column showing the tridentate processes and short foot, 7 anther, 8 pollinia; *all enlarged*.

7. Bulbophyllum polyrhizum, Lindl. Gen. and Spec. Orchid., 53.

Rhizome branching, thread-like, naked; *pseudo-bulbs* globular or ovoid, with a broad base, about 1 in. apart, smooth. *Leaf* narrowly oblong, sub-acute, slightly narrowed to the sessile base, deciduous before the scapes flower, 2·5 in. long and ·35 in. broad. *Scape* filiform, about 4 in. long, its peduncle sub-erect, longer than the raceme, with one or two minute bracteoles; *raceme* inclined, with about six secund distant pale-yellowish flowers ·25 in. long; *floral bract* minute, oblong, about as long as the short stalk of the ovary. *Sepals* spreading, sub-acute; the dorsal ovate, concave; the lateral pair longer, oblong-lanceolate, sub-acute, 3-nerved. *Petals* much shorter than the sepals, broadly ovate, acute, 1-nerved. *Lip* stipitate, deflexed from the base, oblong, obtuse, scaberulous, the basal half grooved. *Column* with very short sharp teeth; its foot short, slightly curved. *Anther* papillose, its lip acute. Hook. fil. Fl. Br. Ind. V, 767: in Ann. Bot. Gard. Calc., V, Pt. I, 15, t. 23.

Sikkim; in the valley of the Teesta; elevation about 1,500 feet; Lister, Pantling No. 260. Nepal; Wallich. Dehra-Dun; Gamble; in flower in April.

In the Dehra Dun specimens the pseudo-bulbs are crowded on the rhizome, and they are so depicted in Wallich's drawing of the Nepal plant. But in Sikkim they are, in the few specimens hitherto collected by Mr. Pantling, as here described and figured, about one inch distant from each other. The flowers, however, agree with those of the Dehra Dun specimens and with Sir Joseph Hooker's description. The plant is quite leafless when flowering; its flowers are of a uniform pale yellow; it is rare in Sikkim. In his *Century of Indian Orchids*, published in the fifth volume of these Annals, Sir Joseph Hooker has described and figured what he considers may either be a variety of this species or a distinct one, for which, in either case, he proposes the trivial name *zonale*. This plant was once found by Mr. Lister in Sikkim; he sent it to the Botanic Garden, Calcutta, where it flowered and was figured in April 1877. It has oblong-ovate pseudo-bulbs, twice (rarely thrice) constricted transversely, as if formed of three internodes; and these internodes are vertically traversed by many deep grooves with tumid interspaces; the whole pseudo-bulb having (as depicted) somewhat the appearance of three superposed rows of green oblong beads; the pseudo-bulbs, moreover, emit surculi from their bases. We have unfortunately not been able to rediscover this plant in Sikkim. In a small living specimen of it received from Mr. J. S. Gamble, Director of the Forest School at Dehra Dun, and grown on the Cinchona Plantation in Sikkim, the pseudo-bulbs were distant from each other very much as represented in the figure of the Sikkim plant. There were also two or three horizontal lines on them, but so inconspicuous as not to be noticed without examination.

Plate 95.—*Bulbophyllum polyrhizum*, Lindl. Leafing and flowering plants, *of natural size*. Fig. 1 flower, 2 bract, stalked ovary, column, foot and lip, *seen from the side*, 3 lip, 4 column with its minute apical teeth and foot, 5 anther, 6 pollinia; *all enlarged*.

8. Bulbophyllum cylindraceum, Lindl. Gen. and Spec. Orchid., 53.

Rhizome stout, ·25 in. thick; *pseudo-bulbs* none. *Leaf* oblong-elliptic, acute, the base tapering to the long petiole; length of blade 5 to 12 in.; petioles nearly as long, channelled. *Scape* 12 to 18 in. long, blackish-purple, the pedicel with a few acute sheathing bracts and a pair at the base; *spike* cylindric, 2 to 3 in. long, nodding. *Flowers* densely crowded and imbricate, dorsally compressed, ·3 or ·35 in. long, blackish-purple (almost black); *floral bract* of a paler colour, ovate-acuminate, longer than the

sessile ovary. *Sepals* sub-connivent, unequal; the dorsal ovate, acuminate; the lateral pair broadly oblong, unequal-sided; their inner edges straight, parallel and cohering, the outer rounded; the apices acute, entire. *Petals* falcate-lanceolate, truncate at the base, the apex acuminate and denticulate. *Lip* thick, ovate, deflexed about the middle, the apex obtuse, papillose, the posterior half deeply grooved. *Column* with large fleshy unequally tridentate apical processes; the foot rather straight, swollen in the middle. *Anther* quadrate, flattened, and with a fleshy oval centre. Wall. Pl. As. Rar. I, t. 69; Hook. fil. Fl. Br. Ind. V, 765.

Sikkim; at elevations of 6,000 to 7,000 feet; Clarke, King, Thompson, Pantling No. 239. Nepal; Wallich. Assam and Khasia Hills; Griffith No. 5128 (Kew Distrib.); J. D. Hooker and T. Thomson; Mann (at 4,000 feet); in flower from October to January.

The column is of a paler purple than the rest of the flower, and the floral bract is of the same tint. The colour of other parts of the flower makes the nearest possible approach to black. The plant which we here figure and describe is that which is found in Sikkim. But, according to Sir Joseph Hooker, there is considerable variation in specimens from different localities. He describes a sheath rising from near the apex of the peduncle and embracing the base of the spike, but this sheath is not usually found in the Sikkim plant. The colour of the flower also is described by him as white or pink; and in a form collected by Wallich in Nepal (but of which no specimen is extant) it is said to be yellow. Sir Joseph admits two varieties, (*a*) *cylindraceum* proper, with the upper sheath of the peduncle embracing the base of the spike, and (*b*) var. *Khasiana*, with the sheath smaller and distant from the spike. The Sikkim plant rarely has this sheath.

The synonymy of these varieties is given by Sir Joseph Hooker as follows:—

cylindraceum proper = *B. imbricatum*, Griff. Notul. III, 289.

var. *Khasiana* = *B. Khasianum*, Griff. Notul. III, 284; Reichb. fil. in Gard. Chron. 1878, II, 716.

PLATE 96.—*Bulbophyllum cylindraceum*, Lindl. A plant, *of natural size*. Fig. 1 dorsal sepal, 2 flower, ovary and bract, 3 ovary, column with its foot, and the lip, *seen from the side*, 4 lip, 5 the petals, 6 column showing its tridentate apical processes, the foot with its anterior dilatation, and the pollinia *in situ*, 7 anther, 8 pollinia; *all enlarged*.

9. BULBOPHYLLUM CAREYANUM, Spreng. Syst. Veg. III, 732.

Rhizome stout, woody, ·2 in. thick; *pseudo-bulbs* erect, ovoid, ribbed, about 3 in. apart, 1·5 in. long and about 1·2 in. in diameter. *Leaf* oblong, sub-sessile, tapering to each end; the apex sub-acute, notched; length 5 to 10 in.; breadth ·8 to 1·65 in. *Scape* about the length of the pseudo-bulb, stout, brown, and clothed with many lanceolate bracts of the same colour, bearing at its apex a densely-flowered decurved raceme 2 to 3 in. long; *floral bract* lanceolate, longer than the stalked ovary. *Flowers* ·25 to ·3 in. long, imbricate, dark brown, shining. *Sepals* unequal; the lateral pair oblong-ovate, acute, cohering by their tips but free at the base; the dorsal smaller, oblong, acute, quite free from the laterals from its base. *Petals* only about one-third of the size of the sepals, fleshy, narrowly triangular, with caudate-acuminate apices and with a few projecting bristle-like teeth on the edges. *Lip* longer than the petals, oblong, with a broad base and two short falcate side lobes or auricles obscurely erose at the apices, the edges minutely ciliolate. *Column* rather stout, with two short broad apical teeth and a short curved foot. *Lip of anther* erose; *pollinia* obovoid. Wall. Cat. 1990-1; Lindl. Gen. and Spec. Orchid., 51; Reichb. fil. in Walp. Ann. VI, 256;

Hook. fil. Fl. Br. Ind. V, 760. *Anisopetalum Careyanum*, Hook. Fl. Exot. t. 149. *Pleurothallis purpurea*, Don Prod. 33. *Tribrachia purpurea*, Lindl. Coll. Bot. 41.

Sikkim; in warm valleys, common; Pantling, No. 23; in flower in October, November and December; distributed westwards to Nepal and eastwards to the Khasia Hills and Burma.

The flowers of the Sikkim plant are of a uniform coppery brown, the column alone being yellow and the petals largely blotched with that colour. In colouration they thus differ from the Nepal plant as figured by Sir William Hooker (under the name *Anisopetalum Careyanum*) in his Exotic Flora, t. 149. In that figure the sepals and petals are depicted as dusky yellow, spotted with brown; the column and petals as yellow; and the lip as purple. The basal lobes of the lip are of the same shape as in the Sikkim plant; the petals, however, are narrower, unspotted, and with no appendages on their margins. In spite, however, of these differences, we believe Sir William Hooker's figure and that here given, to refer to the same species. Sir Joseph Hooker reduces (Fl. Br. Ind. l. c.) to a variety of this, under the varietal name *ochracea*, the plant named *B. cupreum* by Lindley in the Bot. Register, XXIV (1838), Misc. 95, and figured under that name in Bot. Mag. t. 5316. This form, which is found in Burma, has ochraceous sepals and petals and a reddish-brown lip. In all other respects, except colour, its flowers agree with those of the Sikkim plant as here figured. Closely allied to this are *B. sicyobulbon*, Reichb. fil., and *B. crassipes*, Hook. fil. The latter species is described and figured in the Bot. Magazine (t. 4166) as *B. Careyanum*, from which, however, it differs in having a longer column with shorter apical teeth, in having the side lobes of the lip shorter and blunter, and in having (according to the figure 4166) shorter racemes. We have not been able to find *B. crassipes* in Sikkim, and indeed its author attributes it only to the Khasia Hills, although in the Flora of British India Sir Joseph Hooker gives it as a native of Sikkim. *B. sicyobulbon* was described from Burma by Reichenbach *filius*, who distinguishes it from this by its orange-yellow flowers with narrower floral bracts, sub-serrulate petals, and by its larger pseudo-bulbs. Another species to which *B. Careyanum* is closely allied is *B. Pechei*, Cat Bull.. This, which has been described and figured by Sir Joseph Hooker (Bot. Mag. t. 7286), agrees with *B. Careyanum* in its pseudo-bulbs and leaves, in the length of its densely-flowered raceme, and in its bracts and sepals. Its flowers are of the same dull colour as those of the Sikkim form of *B. Careyanum* here figured, and it is probably the same species. A plant (probably belonging to an undescribed species) which recently flowered in the Botanic Garden in Calcutta, and which is believed to have been received from Burma, closely resembles *B. Careyanum*, but has yellow flowers with triangular floral bracts not half so long as the ovaries, a much longer and rather more lax and more slender inflorescence than *B. Careyanum*, smaller petals, and a lip otherwise like that of *B. Careyanum*, but with blunt, not acute, side lobes. It has also smaller pseudo-bulbs than *B. Careyanum*, and in this character disagrees with the description of *B. sicyobulbon*. The flowers of this Burmese plant, like those of *B. Careyanum*, have a disagreeable odour. The plants mentioned in this paragraph belong to a group of *Bulbophyllum*, the lips of which have basal lobes, an unusual character in the genus. The members of the group differ within very narrow limits, and the whole of them want careful study in the field.

PLATE 97.—*Bulbophyllum Careyanum*, Spreng. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, *seen from the side*, 3 lip, 4 column and its foot, 5 petals, 6 anther, 7 pollinia; *all enlarged*.

10. Bulbophyllum triste, Reichb. fil. in Walp. Ann. VI, 253.

Rhizome about ·15 in. thick, naked. *Pseudo-bulbs* turbinate with umbonate apices, close together or ·5 to 1 in. apart, leafless at flowering time, ·7 to ·9 in. in diam. *Leaves* two from each pseudo-bulb, sub-membranous, flaccid, narrowly oblong, gradually tapering to the acute apex and to the sub-sessile base, 3 to 5 in. long and ·6 to ·9 in. broad. *Scape* 3 to 5 in. long; the peduncle slender, erect, with a few filiform bracteoles, twice as long as the drooping rather densely flowered raceme. *Flowers* ·25 in. long, purple; floral bract lanceolate, acute, as long as the sessile ovary. *Dorsal sepal* oblong-ovate, blunt, concave; the lateral pair longer, cohering to the tips, gibbous near the base, their margins incurved. *Petals* triangular, 1-nerved, shorter than the dorsal sepal. *Lip* stipitate, oblong-lanceolate, the anterior half narrowed to the obtuse apex; the upper surface convex and with a divided protuberance. *Column* with subulate apical processes; the foot short, much curved. *Anther* conical, papillose, with a small inflexed lip; *pollinia* globose, the inner two rudimentary. Hook. fil. Fl. Br. Ind. V, 768.

Sikkim; at an elevation of about 1,500 feet, in the valley of the Teesta; Pantling, No. 129; in flower in March. Tenasserim, on the Toungoo range; Lobb, Parish and Berkeley.

A species now recorded for the first time from this province; hitherto supposed to be confined to Burma. The flowers, except for a line of yellow on the edges of the lip and on the ovary, are of a dull purple throughout; the column is greenish passing into white and the foot is minutely spotted with purple. The flowers have a powerful and fœtid odour. The Burmese *B. micranthum*, Hook. fil. (Ic. Plant., t. 2048), must come very near to this.

Plate 98.—*Bulbophyllum triste*, Reichb. fil. Part of a plant growing on the branch of a tree, the leafy pseudo-bulb in outline behind, *of natural size*. Fig. 1 a flower, *side view*, 2 front view of a flower, 3 ovary, column with its foot, and the lip, *seen from the side*, 4 lip, 5 column with its apical processes and the curved spotted foot, 6 an empty anther, 7 pollinia; *all enlarged*.

11. Bulbophyllum bisetum, Lindl. in Ann. Nat. Hist. X, 186.

Rhizome branching, wiry, about ·1 in thick. *Pseudo-bulbs* about 1·5 in. apart, ovoid-conic, smooth, with a fibrous sheath at the base, about ·8 in. long and ·65 to ·75 in. in diam. at the base. *Leaf* narrowly oblong-lanceolate, the apex acuminate and obliquely bifid, the base narrowed to the short petiole; length 3 to 4·5 in., breadth ·6 to ·8 in.; petiole ·25 to ·5 in. *Scape* pendent, filiform, somewhat shorter than the leaf; the peduncle twice as long as the raceme, bearing a few subulate bracteoles. *Raceme* with a much thickened rachis, bearing 12 to 15 crowded broad purplish flowers about ·25 in. long; floral bract lanceolate, shorter than the curved stalked ovary. *Sepals* sub-connivent and with undulate keels; the dorsal ovate-lanceolate; the lateral pair unequal-sided, their inner edges straight and coherent; their outer edges rounded and undulate; the apices free, acuminate and curved upwards. *Petals* shorter than the dorsal sepal, spathulate, entire, and with a pair of linear spurs inserted behind and lying parallel to them and extending beyond their apices. *Lip* stipitate, ovate-lanceolate, deflexed about the middle, the basal portion with two crenate ridges on its upper surface, the apical portion narrowed and pubescent, sub-acute, not ridged. *Column* with two long subulate

apical processes, and with a large callus below the stigma; the foot short, curved. *Anther* apiculate, glandular-pubescent; the lip oblong and ciliate, *pollinia* broadly elliptic. Hook. fil. Fl. Br. Ind. V, 767. *B. cirrhopetaloides*, Griff. Notul. III, 290. *Bulbophyllum* sp., Ic. Pl. Asiat., t. 296, fig. 1. *B. cariniferum*, Reichb. fil. in Walp. Ann. VI, 253.

Sikkim; at Rungbee, elevation 5,000 to 6,000 feet; Pantling, No. 192; in flower in September. Khasia Hills; Griffith (Kew Distrib. No. 5140), Hooker fil. and Thomson (Bolb. 23).

A species not hitherto recorded from Sikkim. The flower is remarkable for the spurs which run parallel to the dorsal sepal and to the petals, and which are homologous with the spurs of the Burmese *B. xylophyllum*. The sepals are dull purple with green on the edges and keels; the lip is purple with a yellowish apex; the petals pale purple with dark purple apices; the column and the spurs lying parallel to the dorsal sepals and to the petals are greenish. Although more closely associated with the dorsal than with the lateral sepals, the two spurs really originate from the apex of the ovary, and not from either the sepals or petals. Griffith suggests that they may be appendages of two of the costæ of the ovary.

PLATE 99.—*Bulbophyllum bisetum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, *side view*, 2 the same, front view, 3 the back of the column with the spurs of the lateral sepals, the spathulate petals, and the apex of the lip, 4 part of ovary, column and its foot, and the lip, *seen from the side*, 5 lip, 6 column with its subulate apical processes and anterior callosity, the anther *in situ*, and the curved foot, 7 anther, 8 pollinia; *all enlarged*.

12. BULBOPHYLLUM CORNU-CERVI, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, Pt. 2, 332.

Rhizome none; pseudo-bulbs minute, crowded, globular, ·1 to ·15 in. in diam. *Leaf* coriaceous, sessile, or shortly petiolate, obovate-elliptic, the apex rounded and entire, tapering slightly to the base, 1 to 1·5 in. long and ·6 to ·8 in. broad; petiole 0 to ·35 in. *Scape* slender, erect, twice as long as the leaves or longer; the peduncle about as long as the raceme, with one or two small remote bracts; raceme slightly decurved, laxly-flowered; floral bract ovate, acute, shorter than the stalked ovary. *Flowers* ·25 in. long, green and yellow. *Dorsal sepal* oblong, blunt, resting on the column, the lateral pair broader, flat and slightly spreading, their margins upturned. *Petals* half as long as the sepals, lanceolate, slightly falcate, acute, 1-nerved. *Lip* fleshy, obovate-oblong, much deflexed from about the middle, stipitate; the basal portion fleshy, grooved in the centre; the anterior portion broader and thinner, convex, entire, blunt. *Column* very short, with stout 2-3-fid broad apical processes varying somewhat in size and shape; the foot flat, very slightly curved, with a short raised mesial line which begins as a hook at the lower margin of the stigma and extends to nearly the apex. *Anther* compressed, its lip truncate.

Sikkim; near the base of the Engo ridge, at an elevation of probably about 2,500 feet; Pantling, No. 264; in flower in July.

The sepals of this are green with reddish-brown margins, the petals are green, the lip yellow in its anterior and reddish-brown in its posterior half. The column and its processes are white, and the foot reddish-brown. The species is named from its columnar processes which resemble in shape the horns of an elk. Its nearest ally is probably the Burmese *B. alcicorne*, Par. and Reichb. fil., which has a short drooping densely-flowered raceme and compressed fleshy flowers.

PLATE 100.—*Bulbophyllum cornu-cervi*, King and Pantling. A plant; of *natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with its foot, and the lip, 3 the petals, 4 lip, 5 column showing the horn-like apical processes and the foot, 6 anther, 7 pollinia; *all enlarged*.

13. BULBOPHYLLUM SECUNDUM, Hook. fil. Ic. Plantar., t. 2042.

Rhizome slender; pseudo-bulbs crowded, turbinate, about ·35 in. in diam, smooth. *Leaf* narrowly oblong, sub-acute, narrowed at the base to the short petiole; length 1 to 2·5 in., breadth ·25 to ·4 in.; petiole ·2 to ·35 in. *Scape* erect, longer than the leaves, slender; the peduncle with one or two sheathing brown bracts; the raceme shorter than the peduncle, laxly-flowered, secund; floral bract minute, ovate, much shorter than the stalked ovary. *Flowers* ·2 to ·25 in. across, purple. *Sepals* broadly triangular, sub-acute, spreading, the dorsal slightly narrower than the lateral pair, 1-nerved; all with ciliolate edges. *Petals* much smaller than the sepals, spathulate-oblong, obtuse, 1-nerved, the anterior half with strongly ciliate edges. *Lip* longer than the petals, oblong, slightly dilated towards the middle, the apex obtuse, the base truncate and with a blackish gland; the edges ciliolate. *Capsule* sub-cylindric, truncate, ·15 in. long. *Column* with two short triangular apical teeth; the foot short, curved. Lip of *anther* erose, *pollinia* broad. Hook. fil. Fl. Br. Ind. V, 764.

Sikkim; at Choong-thang and Tendong; elevation 6,000 to 7,000 feet; Pantling, No. 214. Kohima in the Naga Hills, Assam; Prain; in flower in June and July.

The sepals and petals of this species are pale purple with darker nerves; the petals have a large dark purple blotch near the tip; the lip is dark purple with four longitudinal pale lines, the column green and its foot purple. It is remarkable for its secund habit. Originally discovered in the Naga Hills by Dr. D. Prain of the Calcutta Herbarium, and now recorded from Sikkim for the first time.

PLATE 101.—*Bulbophyllum secundum*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, *side view*, 2 floral bract, stalked ovary, column, foot and lip, 3 lip, 4 column and its foot, 5 anther, 6 pollinia; *all enlarged*.

14. BULBOPHYLLUM STRIATUM, Reichb. fil. in Walp. Ann. VI, 257.

Rhizome woody, ·1 in. thick; pseudo-bulbs obpyriform, ·5 to ·75 in. long., about 2 inches apart, their surfaces cinereous, the flesh dark purple. *Leaf* coriaceous, elliptic, the apex slightly retuse, the blade 1 to 2·5 in. long and ·75 to 1·5 in. broad, the petiole ·5 to nearly 1 inch long, mottled. *Scape* 2 to 2·5 in. long, slender, erect, purplish, with 2 or 3 sheathing bracteoles. *Flowers* 2 to 4, sub-umbellate or shortly racemose, about ·4 or ·5 in. across; floral bract linear, ·15 in. long, about one-third as long as the slender stalked ovary. *Sepals* sub-equal, broadly lanceolate, sub-acute, 5-nerved, spreading. *Petals* much smaller, 3-nerved. *Lip* about as long as the petals, ovate-lanceolate, bent on itself near the base, and with two small erect oblong basal lobes at the bend, the surface of the anterior horizontal part with bold purple nerves, those in the middle straight, those towards the edges reticulate. *Column* long, slender, not toothed. *Anther* conical; *pollinia* ovoid, in two free pairs. Hook. fil. Fl. Br. Ind. V, 755. *Sarcopodium striatum*, Lindl. Fol. Orchid., Sarcopodium 5. *Dendrobium striatum*, Griff. Notul. III, 318.

Sikkim; on Sinchal, at an elevation of about 7,000 feet; Pantling, No. 298; in flower during October. Khasia Hills, elevat. 4,000 feet; Griffith (Kew Distrib. No. 5156), Lobb, Hooker and others.

Khasia specimens have larger flowers than those from Sikkim, but in other respects they agree. This species had not hitherto been collected in Sikkim.

PLATE 102.—*Bulbophyllum striatum*, Reichb. fil. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, *seen in profile*, 3 lip, detached and showing the small basal lobes, 4 column and its foot, 5 anther, 6 pollinia; *all enlarged*.

15. BULBOPHYLLUM HYMENANTHUM, Hook. fil. Ic. Plantar., Ic. 2046.

Rhizome slender and thread-like, naked; pseudo-bulbs none. *Leaves* rising direct from the rhizome nearly 1 inch apart, sessile, fleshy, ovate or elliptic, blunt, ·5 to ·65 in. long and ·25 to ·4 in. broad. *Scape* erect, rising from the rhizome between the leaves and slightly longer than them, with several minute sub-tubular sheaths, and at the apex one or two flowers ·4 or ·5 in. across; floral bract ovate, half as long as the stalked ovary. *Sepals* sub-equal, ovate, acute, 3-nerved, spreading. *Petals* about half the size of the sepals, elliptic-lanceolate, sub-acute, 1-nerved. *Lip* longer than the petals, ovate-lanceolate, sharply deflexed near the base, the apex narrowed but blunt, the upper surface with a deep groove from the base nearly to the apex. *Column* short and without apical processes; its foot long and much curved. *Anther* with a rounded lip; *pollinia* only two, the inner ones being suppressed. Hook. fil. Fl. Br. Ind. V, 767.

Sikkim; in the Lachung Valley, elevation 8,000 feet; Pantling, No. 368; in flower in May. Khasia Hills; at Myrung, elevation 5,000 feet; Hooker and Thomson.

The sepals and petals in this species are yellowish, streaked with purple, the lip being wholly purple.

PLATE 103.—*Bulbophyllum hymenanthum*, Hook. fil. A plant, *of natural size*. 1 a flower, 2 bract, stalked ovary, column with its foot and the lip, *side view*, 3 the petals, 4 lip, 5 column with anther *in situ* and foot, 6 anther, 7 pollinia; *all enlarged*.

16. BULBOPHYLLUM PILULIFERUM, *new species*.

Pseudo-bulbs cœspitose, globose or depressed-globose, ·25 to ·3 in. diam. *Leaf* fleshy, linear-oblong, obtuse, entire, the base narrowed to the very short petiole; length 4 in., breadth ·5 in, petiole ·15 in. *Scape* slender, erect, about two-thirds as long as the leaves, the pedicel with one or two bracts at the base and one or two at intervals above, bearing at its apex a densely crowded semi-globose capitulum of flowers about ·5 in. in diam. *Flowers* ·12 in. across, reddish-brown; floral bract lanceolate, acute, half as long as the sub-sessile ovary. *Sepals* sub-equal, their tips spreading, acute, the dorsal lanceolate, the laterals ovate and parallel. *Petals* shorter than the sepals, narrowly lanceolate, acute. *Lip* longer than the petals but shorter than the sepals, elliptic, tumid, papillose, much deflexed from the base; the posterior portion deeply grooved; the anterior convex with entire edges and broad rounded apex. *Column* very short; the apical processes broadly triangular, their apices slightly erose; the foot longer than the column. *Anther* truncate, the margin of its lip erose; *pollinia* pyriform, the inner pair much reduced.

Sikkim; at an elevation of 1,000 feet; Pantling, No. 141; in flower in May; only one plant found.

The sepals and petals are of a pale reddish-brown, with streaks of a darker shade of the same colour. The lip is dark reddish-brown.

PLATE 104.—*Bulbophyllum piluliferum*, King and Pantling. A plant; of *natural size*. Fig. 1 a flower, *seen from the side*, 2 a flower, *front view*, 3 lip, 4 ovary, column and its foot, and the lip, *from the side*, 5 column showing its apical processes and foot, 6 anther, 7 pollinia; *all enlarged*.

17. BULBOPHYLLUM GRACILIPES, King and Pantling in Journ. As. Soc Bengal, Vol. LXV, pt. 2, 118.

Rhizome ·15 in. thick, bearing the remains of sheaths and also leaves at intervals of ·8 to 1·25 in., pseudo-bulbs none. *Leaf* solitary, subcoriaceous, oblanceolate or elliptic-oblanceolate, obtuse and minutely bifid at the apex (sometimes obliquely so), much narrowed to the sessile or sub-sessile base; length 1 to 2·25 in. *Scape* erect, filiform, longer than the leaves and rising either at the base of a leaf or from an interspace, with one sheathing bract at the base and another at the middle; the flowers crowded in a capitulum about ·35 in. in diam.; floral bract ovate, half as long as the shortly stalked ovary. *Flowers* ·1 in. across, fleshy and of a dull purple colour, dorsally compressed. *Sepals* sub-equal, 3-nerved; the dorsal triangular, lying close to the column, its apex acute, revolute; the lateral pair ovate, acute, spreading but slightly. *Petals* shorter than the sepals, oblong, falcately acute, 1-nerved. *Lip* obovate, tumid, decurved from the middle, the whole of its surface papillose, the posterior portion deeply grooved, the anterior convex, dilated, the edges entire and the apex broad. Apical processes of the column broad, abruptly pointed. *Anther* depressed, its lip truncate; *pollinia* pyriform, all four uniform.

Sikkim; in the valley of the Teesta and elsewhere at elevations of about 1,500 feet; Pantiing, No. 242; in flower during September and October; rather plentiful in the localities where it occurs.

The flowers of this are of a dull purple throughout. It resembles *B. piluliferum*, King and Pantling, in its capitate inflorescence, and to some extent in its flowers; but differs in having no pseudo-bulbs, and in having oblanceolate and not linear-oblong leaves widely distant on a rhizome. This is still more closely allied to *B. xylophyllum*, Reichb. fil., but that species has spurs at the base of the dorsal sepals which are quite absent in this; it has, besides, blunt lateral sepals. Moreover the leaves of *B. xylophyllum* are very much thicker in texture and their broad apices are emarginate; its flowers, moreover, are yellowish-green and are larger than the flowers of this.

PLATE 105.—*Bulbophyllum gracilipes*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, *seen from the front*, 2 floral bract, stalked ovary, column with its foot, and the lip, *seen from the side*, 3 the petals, 4 lip, 5 column and its foot, 6 anther, 7 pollinia; *all enlarged*.

18. BULBOPHYLLUM REPTANS, Lindl. in Wall. Cat. 1988; Gen. and Spec. Orchid. 51.

Rhizome thin, wiry, naked, branching, ·1 in. in diam.; pseudo-bulbs 2·5 in. apart, obpyriform, smooth, ·6 to ·75 in. long. *Leaf* linear-oblong, sub-acute, obliquely notched at the apex, slightly narrowed at the base to the very short petiole; length 3·5 to 6 in., breadth ·25 to ·35 in.; petiole ·2 in. *Scapes* shorter or longer than the leaves, often in pairs, slender, more or less decurved; the peduncle sheathed at base, bracteate, varying in length, sometimes longer, sometimes shorter than the laxly-flowered raceme;

floral bract largest in the lower flowers of the spike, half as long as the upper, oblong-lanceolate, usually longer than the shortly-stalked ovary. *Flowers* ·25 to ·35 in. long, yellowish with purple spots. *Sepals* sub-equal, lanceolate, 3-nerved, spreading, the lateral pair with dilated bases. *Petals* much shorter than the sepals, oblong, blunt, 1-nerved, spreading. *Lip* about as long as the petals, stipitate, oblong, expanded and grooved at the base, the apex narrowed and sub-acute, the margins more or less winged, deflexed from the middle. *Column* with filiform apical processes and short lateral wings; the foot short, tumid near the stigma, slightly curved; *pollinia* sub-globose, the two inner small. Hook. fil. Fl. Br. Ind. V, 768. *B. Clarkei*, Reichb. fil. in Journ. Linn. Soc. XXV, 72. *Tribrachia reptans*, Lindl. Coll. Bot. t. 41A.

Sikkim; common at altitudes between 5,000 and 7,000 feet, Griffith (Kew Distrib. 5129); Pantling, No. 7; in flower from October to December. Distributed westwards to Nepal and eastwards to the Naga and Khasia Hills; a common plant; Griffith (No. 1573, Kew Distribution).

Var. *sub-racemosa*, Hook. fil. Fl. Br. Ind. V, 769. Bracts oblong, obtuse, much shorter than the longer pedicelled ovary. *B. grandiflorum*, Griff. It. Notes, 146, No. 705; Notul. III, 293; Ic. Pl. Asiat., t. 294, fig. 1.

Sikkim, Bhotan and Khasia Hills, Griffith (Kew Distrib., 5130); Clarke, No. 14814.

The sepals of this are buff-coloured, flushed with brown and speckled slightly with red; the petals are buff, the lip buff at the base and yellow at the tip, the column green and white, the ovary green with red spots.

PLATE 106.—*Bulbophyllum reptans*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, shortly stalked ovary, column with its foot and the lip, *seen from the side*, 3 lip, 4 the petals, 5 column to show the apical processes and tumid foot, 6 anther, 7 pollinia; *all enlarged*.

19. BULBOPHYLLUM EUBLEPHARUM, Reichb. fil. in Walp. Ann. VI, 252.

Rhizome none; pseudo-bulbs close together, cylindric, slightly thickened at the base, dark brown in colour, ·25 to ·3 in. long. *Leaf* oblong, acute, much narrowed to the sessile base; length 4 to 7 in., breadth ·75 to 1·5 in. *Scape* 10 to 18 in. long, decurved; the pedicel much longer than the raceme, spotted with brown and bearing two or three sheathing bracts about 1 in. long at intervals, and several shorter spreading near the apex. *Raceme* only 3 to 4 in. long, laxly-flowered; floral bract oblong-lanceolate, concave, acute, as long as the ovary. *Flowers* ·6 in. long, green. *Lateral sepals* ovate-lanceolate, acuminate; the dorsal slightly shorter, less acuminate and more concave. *Petals* half as long as the sepals, broadly elliptic, blunt, obscurely 5-nerved, the edges shortly ciliolate. *Lip* thick, oblong-lanceolate, the apex blunt and emarginate, the upper surface deeply grooved in the lower half, the edges towards the base glandular-ciliolate. *Column* broad, with subulate apical teeth, much swollen below the stigma; its foot short, much curved. *Anther* hooded; *pollinia* oblong with oblique ends, the inner two much reduced. Hook. fil. Fl. Br. Ind. V, 764; in Ann. Bot. Gard. Calc. V, 16, t. 24.

Sikkim; Griffith (Kew Distrib. No. 5296); at Sureil, elevation about 6,000 feet; Pantling, No. 46. On Tongloo, at 7,000 feet; T. Anderson, King; in flower in August.

PLATE 107.—*Bulbophyllum eublepharum*, Reichb. fil. Part of a plant, *of natural size*. Fig. 1 flower with its ovary and bract, 2 column and lip, *seen from the side*, 3 lip, 4 apex of lip, showing the minute emargination, 5 column and its foot and anther, 6 anther, 7 and 8 pollinia, seen from above and from below; *all enlarged*. Fig. 9 capsule, *of natural size*.

20. BULBOPHYLLUM PENICILLIUM, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 151.

Rhizome stout, wiry, ·2 in. thick; pseudo-bulbs close together or ·5 in. apart, broadly ovoid, ·75 to 1 in. long, and about ·6 to ·7 in. in diam. at the base. *Leaf* 4·5 to 6·5 in. long, oblong-lanceolate, acute, narrowed at the base into a channelled petiole 1·5 to 2 in. long. *Scape* longer than the leaf; the peduncle with 3 or 4 sheathing lanceolate bracts; the *raceme* longer than the peduncle, inclined or decurved, and with a stouter rachis, laxly-flowered; floral bract large, ovate, acute, as long as the shortly stalked ovary. *Flowers* ·5 in. across, opening 3 or 4 at a time, brown. *Sepals* sub-equal, narrowly lanceolate, with broad concave 5-nerved bases and caudate-acuminate apices, about ·4 in. long. *Petals* much smaller than the sepals, orbicular, fleshy, the anterior half with the margins and apex softly bearded. *Lip* slightly longer than the sepals, very mobile, lanceolate with a truncate auricled base, broadly fimbriate-fringed except at the base. *Column* stout, with two elongate minutely capitate erect teeth at the apex, and a protuberance under the stigma; its foot short and much curved. *Anther* conical with a fimbriate crest; *pollinia* unequal. Hook fil. Fl. Br. Ind. V, 764.

Bhutan; at Song-chong-loo, elevation 6,000 feet; Pantling No. 251; flowering in August and September.

The colour of the sepals and petals is of a uniform brown, the lip being of a paler tint; the rachis is also dark brown. The lower part of the raceme is occupied by empty bracts. Except in the colour of the flowers, this Bhutan plant agrees exactly with the type specimens of *B. Penicillium* which were collected in Burma. We have no doubt whatever, after careful comparison of specimens of both at Kew, that the Bhutan and Burma plants are conspecific. Although not strictly speaking a native of Sikkim, this was found so near the frontier, and is such a remarkable plant, that we have included it in this work. The lip is so extremely mobile that it responds to the faintest movement of the air. The nature of the motion, which is spasmodic rather than oscillatory, is described in the following note by Mr. Pantling: "I have recently carefully observed the behaviour of the lip of this species, and I find that the lip does not oscillate, but has a jerky movement. In its normal position it is pressed to the face of the column as shown in figure 1. The only other position which I have ever seen it occupy is that of extreme depression, as depicted in fig. 4; there is no intermediate position whatever. The movement from the one position to the other is sudden and spasmodic; and so extremely delicate is the balance that, even when the air appears to be quite still, a lip here and there may be observed suddenly to drop, and as suddenly to resume its normal position."

PLATE 108.—*Bulbophyllum Penicillium*, Par. and Reichb. fil. A plant; *of natural size*. Fig. 1 a flower, 2 the petals, 3 lip, from the base, 4 bract, ovary, column with its foot, and the lip, 5 column, to show the processes at its apex and the protuberance in its front, and also the short much-curved foot, 6 anther, 7 under-surface of the pollinia; *all enlarged*.

21. BULBOPHYLLUM ODORATISSIMUM, Lindl. in Wall. Cat. 1987.

Rhizome woody, thin, branching, naked, ·1 in. thick; pseudo-bulbs sub-cylindric, slightly thickened in the lower half, smooth, ·75 to 1 in. long. *Leaf* oblong-lanceolate, slightly notched at the apex, and somewhat narrowed at the sessile base; 1 to

3 in. long and ·25 to ·75 in. broad. *Scape* from near the base of a pseudo-bulb, nearly as long as the leaf, clothed with pale lanceolate sheathing bracts, and with several large brown scarious sheaths at its base; bearing many flowers in a compact umbel or capitulum ·5 to ·75 in. in diam.; floral bract lanceolate, concave, entire, exceeding the stalked ovary. *Flower* ·2 to ·3 in. long, white. *Sepals* sub-equal, lanceolate, acuminate, falcate, spreading, the tips terete. *Petals* about one-sixth of the size of the sepals, ovate. *Lip* slightly longer than the petals, fleshy, oblong-lanceolate, convex, but with a central groove covered with capitate hairs, the margin fringed with similar hairs. *Column* stout, its foot very short, its apical teeth small, slightly winged below; stigma prominent. *Anther* with a thickened papillose crest. *Pollinia* divergent, the inner two very small. Hook. fil. Fl. Br. Ind. V, 758. *Stelis odoratissima*, Smith in Rees' Cyclop. XXXIV; *S. caudata*, Don Prodr., 32. *Tribrachia odoratissima*, Lindl. Coll. Bot. 41.

Sikkim; alt. 3,000 to 7,000 feet; Hooker and others; common; Pantling, No. 16; in flower from May to September. Chumbi Valley. Nepal; Wallich. Khasia Hills. Tenasserim; Helfer (Kew Distrib., Nos. 5167, 5168). Moulmein; R. Scott. Also found in China.

The flowers are in the main white, but the sepals and back of the column and its foot are tinged with yellow. The flowers are sweet-smelling. Some specimens in the Calcutta herbarium are noted as having been found at so low an elevation as 1,000 feet in the Teesta valley. The elevation at which the specimens from the Khasia Hills and Burma were collected is not known. No nerves are visible in the sepals or petals when fresh. Plants from high elevations have longer flowers than those from lower levels.

PLATE 109.—*Bulbophyllum odoratissimum*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, seen from the side, 3 lip, 4 capitate hairs from the central groove on the lip, 5 column and its foot, 6 anther, 7 pollinia; *all enlarged*.

22. BULBOPHYLLUM CAULIFLORUM, Hook. fil., Ic. Plantar., t. 2036.

Rhizome woody, branching, naked, ·15 in. thick. *Pseudo-bulbs* cylindric-elliptic, about 3 in. apart, ·1 to 1·75 in. long, obliquely attached to the rhizome. *Leaf* oblong, obtuse, suddenly narrowed at the base into the short petiole; length 2 to 4 in., breadth ·75 to 1·25 in., petiole ·25 in. *Scape* about as long as the pseudo-bulb, slender, sub-umbellately 4-to 5-flowered, bracteate at the base; floral bracts equalling or exceeding the stalked ovaries, lanceolate, acute, entire. *Flowers* ·5 or ·6 in. long, green, flushed with brown. *Sepals* linear-lanceolate, caudate-acuminate, rather longer than the lanceolate petals, their apices curved or hooked, all entire and spreading slightly. *Lip* shorter than the petals, lanceolate, deflexed below the middle, excavated along the middle of the upper surface, the apex sub-acute, the base truncate and jointed on to the apex of the rather short curved foot. *Column* broad, with two long decurved filiform spurs at the apex, stigmatic cavity very large. *Anther* with a small acute upturned lip; inner pair of *pollinia* much reduced. Hook. fil. Fl. Br. Ind. V, 758.

Sikkim; Griffith (Kew Distrib. No. 5165), Hooker; on Sittong, in the Government Cinchona Plantation, elevation 5,000 to 6,000 feet, Pantling, No. 221; in flower in July. Khasia Hills; Griffith (Kew Distrib. No. 5139).

Allied to *B. odoratissimum*, Lindl., but a larger plant with shorter fewer-flowered scapes. The flowers of this are inodorous. The tips of the sepals are tinged with yellow.

PLATE 110.—*Bulbophyllum cauliflorum*, Hook. fil. A plant; *of natural size.* Fig. 1 sepals and petals, separated, 2 a flower, *lateral view*, 3 bract, column with its foot, and the lip, *seen from the side*, 4 lip, 5 column and its foot, showing the large stigma, 6 anther, 7 pollinia; *all enlarged.*

23. BULBOPHYLLUM PROTRACTUM, Hook. fil., Ic. Plantar. 2037.

Rhizome slender, woody, branching, naked below, bracteate towards the apex, ·1 in. in diam.; pseudo-bulbs sub-erect, cylindric, about 1 inch apart, ·6 to ·8 in. long. *Leaf* oblong, acute, narrowed to the sessile base, thinly coriaceous, 1·5 to 2 in. long and from ·3 to ·5 in. broad. *Scapes* filiform, slightly longer than the pseudo-bulbs, rising from the rhizome at the bases of and also between the pseudo-bulbs, minutely bracteate, umbellately 2- to 3-flowered; floral bract not half the length of the slender stalked ovary, lanceolate. *Flowers* ·25 in. long, yellowish and orange. *Sepals* linear-lanceolate, acuminate, the dorsal rather shorter than the lateral pair, entire, slightly spreading. *Petals* narrowly elliptic-oblong, acute, shorter than the sepals. *Lip* shorter than the petals, lanceolate, sub-acute, entire, the upper surface concave and with two parallel ridges meeting near its apex; the base joined by a fine point to the apex of the short stout curved foot of the column. *Column* stout, with two long slender linear horizontal spurs from its apex. Lip of *anther* large, its margin crenulate. *Pollinia* broad, compressed, the inner pair small. Hook. fil. Fl. Br. Ind. V, 758.

Sikkim; in tropical valleys, at elevations of 1,500 to 2,000 feet; Pantling, No. 230; in flower in July. Tenasserim, Helfer (Kew Distrib. No. 5164). Pegu; Brandis, No. 1045.

Even in fresh flowers the sepals are seen to have three and the petals one nerve. The flowers are pale yellow, the sepals being orange in their upper half, and the concavity of the lip being also orange. The species has not previously been recorded from Sikkim.

PLATE 111.—*Bulbophyllum protractum*, Hook. fil. A plant; *of natural size.* Fig. 1 a flower with its stalked ovary and bract, *seen from the side*, 2 column and lip, 3 lip, 4 column and its foot, 5 anther, *inside view*, 6 pollinia; *all enlarged.*

24. BULBOPHYLLUM LEPTANTHUM, Hook. fil. Ic. Plantar., t. 2039A.

Rhizome about ·15 in. thick, naked except at the growing point; pseudo-bulbs 1 to 1·25 in. long, cylindric, 1·5 in. apart, with several short sheaths at the base. *Leaf* narrowly oblong, the apex blunt and slightly notched, slightly narrowed to the sessile or sub-sessile base; length 2·25 to 2·75 in., breadth ·5 to ·6 in. *Scapes* from the rhizome near the base of the pseudo-bulbs and also from the spaces between them, varying in length, sometimes shorter, sometimes longer than the pseudo-bulbs, always erect, slender, and with one or two small tubular sheaths and bearing at their apices an umbel of three to five flowers ·3 to ·35 in. long; floral bract lanceolate, acuminate, as long as the stalked ovary. *Sepals* lanceolate, caudate-acuminate, spreading, the dorsal slightly shorter than the lateral pair. *Petals* about one-fourth of the length of the sepals, ovate, acute, 1-nerved. *Lip* slightly longer than the petals, ovate-oblong, blunt, decurved from the thickened stipitate and slightly grooved base, the margins revolute. *Column* stout, with small triangular apical processes, and narrow lateral wings; the foot short, curved, tapering to

the apex. *Anther* with a fleshy convex belt in the middle, its lip truncate; the pairs of *pollinia* diverging. Hook. fil. Fl. Br. Ind. V, 759. *B. cylindricum*, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, p. 333.

Sikkim; at Mungpoo, elevation about 3,000 feet; King; Pantling, No. 322; in flower in July. Khasia Hills; elevation 4,000 to 5,000 feet; Griffith, Hooker and Thomson (Bolb. No. 18).

This comes very near *B. protractum*, Hook. fil., but has shorter petals, a slightly different column and lip, a longer and more slenderly stalked ovary, and a much longer floral bract. *B. protractum* has besides smaller pseudo-bulbs. This is also closely allied to *B. Gamblei*, but differs in the points noted under that species. The flowers of this are of a pale yellowish green, with a blotch of orange on the foot of the column.

PLATE 112.—*Bulbophyllum leptanthum*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with its foot, and the lip, *seen from the side*, 3 lip, 4 column and its foot, showing the apical processes and wings, 5 the petals, 6 anther, 7 pollinia; *all enlarged*.

25. BULBOPHYLLUM GAMBLEI, Hook. fil. Ic. Plantar., 2058B; Fl. Br. Ind. VI, 190.

Rhizome very slender, thread-like, naked; pseudo-bulb narrowly obpyriform or sub-cylindric, 1·5 to 4 in. apart, erect, ·5 to ·65 in long. *Leaf* oblong-lanceolate, notched at the apex, narrowed at the base, sub-sessile, 1 to 1·25 in. long and about 25. in. broad. *Scape* filiform, ·75 in. to 2 in. long, with two sheathing bracts. *Flowers* in umbels of three to six, about ·3 in. long; floral bract large, ovate, acute, nearly as long at the stalked ovary. *Sepals* lanceolate, caudate-acuminate, sub-equal, spreading, twice as long as the oblong-lanceolate, acute, 1-nerved petals. *Lip* oblong-lanceolate, sub-acute, the anterior part with a central groove deepening towards the concave base. *Column* broad with triangular acuminate apical teeth, narrowing downwards into the short, much curved slender foot. Lip of *anther* everted; *pollinia* unequal, the inner two very small; the external large, elliptic-rotund, compressed. *B. leptanthum*, var. *Gamblei*, Hook. fil. Fl. Br. Ind. V. 759.

Sikkim; on Engo, elevation from 5,000 to 7,000 feet; Pantling, No. 219; in flower during July and August; forms large tangled masses on trees in damp forests.

This species closely resembles *B. leptanthum*, Hook. fil. But this has broader floral bracts, which are not acuminate, 1-nerved oblong petals, and longer columnar teeth. It has also a much more slender rhizome, shorter pseudo-bulbs, longer and more slender scapes; and it is altogether a smaller plant in every respect except its flowers, and they are longer than those of *B. leptanthum*.

PLATE 113.—*Bulbophyllum Gamblei*, Hook. fil. A plant; *of natural size*. Fig. 1 sepals and petals; *of natural size*, 2 a flower, 3 floral bract, stalked ovary, column and lip, in profile, 4 lip, 5 column with its foot and anther *in situ*, 6 anther, 7 pollinia; *all enlarged*.

26. BULBOPHYLLUM CLARKEANUM, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, p. 333.

Rhizome about the thickness of a crow-quill, branching, naked; pseudo-bulbs cylindric or cylindric-ovoid, 1 to 1·25 in. apart, ·4 to ·6 in. long, smooth. *Leaf* narrowly elliptic-oblong, the apex blunt and notched, the base narrowed, sessile; length 1 to 1·25 in., breadth ·3 to ·4 in. *Scape* filiform, ·5 to 1 in. long, with 1 or 2 sheathing bracts, umbellately 2-to-3-flowered. *Flowers* whitish, ·35 in. long; floral

bract lanceolate, sub-acute, half as long as the stalked ovary. *Sepals* sub-equal, spreading, lanceolate, with broad bases and caudate-acuminate fleshy tips. *Petals* broadly ovate, acute, 3-nerved. *Lip* ovate-oblong, decurved from the thickened grooved basal portion, the anterior portion narrowed, thin and slightly erose at the sides, the apex sub-acute and recurved. *Column* with rather long straight subulate spurs, its foot short and much curved. *Anther* with a small quadrate lip; outer *pollinia* broad, sub-orbicular, the inner two minute.

Western Dooar of Bhutan; in the Kumai forest near the JalJacca river, elevation about 1,500 feet; Pantling, No. 319; in flower in June.

The nearest ally of this species is probably the Burmese *B. stenobulbon*, Par. and Reichb. fil., but that has different pseudo-bulbs and leaves. The sepals and petals of this are white tinged with orange-red at the tips; the lip and column are yellow or yellowish-white. It is also allied to *B. Gamblei* and to *B. leptanthum*.

PLATE 114.—*Bulbophyllum Clarkeanum*, King and Pantling. A plant; *of natural size*. Fig. 1 a flower, *front view*, 2 floral bract, stalked ovary, column with its foot and lip, *seen from the side*, 3 lip, 4 column and its foot, showing the apical spurs, 5 anther, 6 pollinia; *all enlarged*.

27. BULBOPHYLLUM EBULBUM, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, 334.

Rhizome ·15 in. thick, naked except at the growing point; pseudo-bulbs none. *Leaves* solitary, rising 2 inches apart, rather thin, oblong-lanceolate, acute, tapering slightly at the base to the long channelled petiole; length 6 or 7 in., breadth about 1·2 in.; petiole 1·5 to 1·75 in. *Scape* rising immediately in front of a leaf, erect, shorter than the leaf; the peduncle sheathed at the base, less than half as long as the many-flowered raceme. *Flowers* ·3 in. long, not crowded, pale green; floral bract, large, lanceolate, as long as the curved stalked ovary. *Sepals* lanceolate, acuminate, the dorsal somewhat shorter than the lateral. *Petals* half as long as the lateral sepals, linear-lanceolate, 1-nerved. *Lip* longer than the petals, oblong, stipitate, deflexed from the middle, the basal portion grooved, the anterior flat, the edges entire and the apex sub-obtuse. *Column* stout with small quadrate wings surmounted by minute teeth, tumid below the stigma; the foot long. *Anther* thickened vertically in the middle; *pollinia* elliptic.

Sikkim; at Sivoke, elevation about 1,500 feet; Pantling, No. 323; in flower in June; only once gathered.

A species near the Burmese species *B. apodum*, Hook. fil., from which, however, it is distinguished by the shape and thinner texture of its leaves, by the more slender inflorescence and larger flowers. *B. apodum*, Hook. fil., has moreover rudimentary pseudo-bulbs, while this species has no trace of such.

PLATE 115.—*Bulbophyllum ebulbum*, King and Pantling. A plant; *of natural size*. Fig. 1 a flower, *side view*, 2 floral bract, stalked ovary, column with its foot, lip, *side view*, 3 lip, 4 column, showing the short apical processes and tumid base, 5 petals, 6 anther, 7 pollinia; *all enlarged*.

28. BULBOPHYLLUM THOMSONI, Hook. fil. Ic. Plantar., t. 2041.

Rhizome about ·12 in. thick, branching, naked; pseudo-bulbs about 2·5 in. apart, depressed-turbinate, almost discoid, ·8 to 1 in. in diam. and only ·25 in. from base to apex, smooth. *Leaf* narrowly oblong, acute, slightly narrowed to the

petiole, 4 to 6 in. long and about ·8 in. broad; the petiole ·5 to ·75 in. *Scape* erect, slender, usually slightly longer than the leaf; the peduncle about equal to the raceme, with a few small scattered bracteoles; *raceme* many-flowered; floral bract minute, half as long as the shortly-stalked ovary, lanceolate. *Flowers* about ·25 in. long, yellowish-white. *Sepals* sub-equal, lanceolate, with broad bases and acuminate apices; the lateral rather broader at the base than the dorsal; all sub-connivent. *Petals* half as long as the sepals, oblong, sub-acute, the edges ciliolate. *Lip* thick, oblong, slightly wider at the broad obtuse smooth apex, shortly clawed at the base; the upper surface with an elongate depression near the base, the edges ciliolate especially towards the base. *Column* short, its apical teeth minute, narrow, the foot short and almost straight. *Anther* with a papillose crest. Hook. fil. Fl. Br. Ind. V, 764.

Sikkim; in tropical valleys ascending to 4,000 feet; Thomson, King, Pantling No. 245; in flower in September.

In habit this somewhat resembles *B. gymnopus;* the inflorescence is like that of *B. hirtum*, but the raceme is quite erect, not drooping as in *B. hirtum.* Moreover that species has 2-leaved pseudo-bulbs.

PLATE 116.—*Bulbophyllum Thomsoni*, Hook. fil. A plant; *of natural size.* Fig. 1 a flower with stalked ovary and bract, 2 part of ovary, column and its foot, and the lip, *seen from the side*, 3 the petals, 4 lip, 5 column and its foot, *seen from the front*, 6 anther, 7 pollinia; *all enlarged.*

29. BULBOPHYLLUM HIRTUM, Lindl. in Wall. Cat. 1989; Gen. and Spec. Orchid., 51.

Rhizome about ·2 in. thick; pseudo-bulbs close together, ovoid-oblong, terete, with a scarious terminal collar, 1 to 1·5 in. long. *Leaves* in pairs, flaccid, absent at flowering time, oblong-lanceolate or oblong-oblanceolate, sub-acute, narrowed towards the equitant base; length 4 to 9 in., breadth ·75 to 1·75 in. *Scape* longer than the leaves, stout, erect, with one or two small remote bracts. *Spike* about from one-third to one-half of the length of the erect peduncle, densely-flowered, pendulous; floral bract ovate, acute, entire, shorter than the sessile pubescent ovary. *Flowers* ·25 to ·3 in. long, imbricate, green. *Sepals* unequal; the lateral pair falcate-lanceolate, caudate-acuminate, converging; the dorsal smaller, not acuminate, not spreading; all green and pubescent on the outer surface, white on the inner. *Petals* only a third of the length of the sepals, ovate, with acute apices and ciliolate edges. *Lip* oblong, decurved from the base; the apex broader, emarginate and decurved, its upper surface with broad papillose margins and an elongate central glabrous groove. *Column* short, its apical spurs minute; the foot much curved. *Anther* conical, compressed at the apex, and with a broad vertical papillose green band down the centre; *pollinia* obovoid, minute. Hook. fil. Fl. Br. Ind. V, 762. *B. suave*, Griff. Notul. III, 292. *Stelis hirta*, Smith in Rees' Cyclop. XXXIV. *Tribrachis hirta*, Lindl. Coll. Bot. 41.

Sikkim; at elevations of 3,000 to 6,000 feet; common. Pantling, No. 9; in flower from October to January. Distributed westwards to Nepal and eastwards to the Khasia Hills, and also to the Burmese hill ranges.

The sepals are of the palest yellow-green outside and white inside, and the lip is yellow. The whole plant smells of *Anthoxanthum odoratum*, and is much prized on account of its fragrance by the Lepcha aborigines, whose name for it is "*Sur-voo-reep.*" Allied to this are the Burmese species *B. comosum*, Collett and Hemsley, and *B. auricomum*, Lindl.

PLATE 117.—*Bulbophyllum hirtum*, Lindl. A plant; *of natural size.* Fig. 1 the petals, 2 flower, ovary and bract, 3 lip, 4 ovary, column and its foot and the lip, 5 anther, 6, pollinia; *all enlarged.*

7. Cirrhopetalum, Lindl.

Epiphytal; usually with a creeping rhizome, but sometimes coespitose; pseudo-bulbs 1-rarely-2 leaved. *Leaves* usually solitary from each pseudo-bulb, coriaceous and persistent; rarely in pairs, membranous and deciduous. *Scape* rising from the base of a pseudo-bulb. *Flowers* usually in whorled umbels, sometimes capitate, rarely racemose, often dorsally compressed. Dorsal *sepal* concave, short, rarely half as long as the lateral pair, and usually much shorter; lateral sepals usually much elongate and acuminate, oblique, often cohering by their inner edges, the bases adnate to the sides of the column or of its foot. *Petals* shorter than the dorsal sepal. *Lip* small, tumid, usually entire, always shorter than the dorsal sepal, jointed to the end of the foot of the column and more or less mobile. *Column* short; its apex with two (rarely four) tooth-like appendages; the foot more or less produced. *Anther* bilocular; *pollinia* 4, cohering in a single mass and sometimes attached by their lower ends to a mass of viscid tissue; the inner two usually small and lamelliform.

A genus of about forty species, chiefly Indo-Malayan; very closely allied to *Bulbophyllum*, and not separated from that genus by any really good character, but artificially distinguished by the shortness of the dorsal and the great length of the lateral sepals, and by the flowers being usually in whorled umbels, rarely in racemes or heads.

Pollinia without any viscus.

* Lateral sepals cohering to their apices, or almost to their apices, to form a flattened blade.

Leaves in pairs from coespitose pseudo-bulbs, caducous; flowers in drooping racemes.

Dorsal sepal more than half as long as the lateral pair . . 1. *C. viridiflorum.*

Dorsal sepal only about one-tenth of the length of the lateral pair . . . . . 2. *C. refractum.*

Leaf solitary; pseudo-bulbs borne on an elongated creeping rhizome.

The blade formed by the lateral sepals narrow and tapering near the apex.

Scape half as long as the leaf; flowers 1·5 in. long; pseudo-bulbs 1·75 to 2 in. long . . . . . 3. *C. cornutum.*

Scape equal to or exceeding the leaf; flowers ·75 to 1 in. long; pseudo-bulbs ·65 to 1·2 in. long . . . 4. *C. Wallichii.*

Scape not much longer than the pseudo-bulb . . . 5. *C. brevipes.*

The blade formed by the lateral sepals broader at the apex than the base.

Scape and umbel only twice as long as the pseudo-bulbs and much shorter than the leaf . . . . . 6. *C. bootanense.*

Scape much longer than the pseudo-bulbs, longer than or nearly as long as the leaf.

Dorsal sepal and petals not ciliate; the petals awned at the apex and with erose margins; the apex of the lip emarginate . . . . . 7. *C. Andersoni.*

Dorsal sepal and petals with ciliate edges, the apex of the lip entire . . . . . 8. *C. Sikkimense.*

** Lateral sepals partially cohering.

Pseudo-bulbs small, discoid, distant, borne on a long rhizome . . *9. C. sarcophyllum.*

Pseudo-bulbs ovoid, crowded, rhizome none . . . . . *10. C. coespitosum.*

*** Lateral sepals not at all coherent.

Pseudo-bulbs on a rhizome.

Flowers umbellate, ·6 in. long . . . . . *11. C. parvulum.*

Flowers capitate, ·8 to 1·35 in. long; the lateral sepals with very long filiform tails . . . . . *12. C. caudatum.*

Pseudo-bulbs crowded, rhizome none . . . . . *13. C. elatum.*

Pollinia attached to a viscus.

Lateral sepals divergent, their margins involute; flowers ·75 in. long, in racemes . . . . . *14. C. guttulatum.*

Lateral sepals divergent, free but converging; the upper margin up-turned; flowers ·4 in. long, in umbels . . . . . *15. C. maculosum.*

Lateral sepals with filiform tails many inches long, free at the base and apex, otherwise coherent; dorsal sepal with elongated apex bearing coloured paleae; flower solitary . . . . . *16. C. ornatissimum.*

1. Cirrhopetalum viridiflorum, Hook. fil. Ic. Plantar., t. 2061.

Coespitose; pseudo-bulbs ovoid, often much tapered to the apex, 1 to 1·25 in. long. *Leaves* thin, in pairs on the young pseudo-bulbs, deciduous after flowering time, narrowly oblong or oblong-lanceolate, the apex acute, the base narrowed, sessile; length 3·5 to 5 in., breadth 1 to 1·4 in. *Scape* with an erect peduncle, 3 to 5 in. long, sheathed at the base, and with two or three distant sheathing bracts; raceme drooping, from 2 to 4 in. long, many-flowered. *Flowers* about ·75 in. long, drooping, imbricate; floral bract ovate, acuminate, 3 nerved, longer than the shortly stalked thick ovary. Dorsal *sepal* ovate-oblong, sub-acute, depressed; the lateral pair less than twice as long as the dorsal, dimediately ovate-lanceolate, cohering from base to apex. *Petals* sub-orbicular, the edges with a dense belt of short purple gland-like hairs. *Lip* longer than the petals but shorter than the dorsal sepal, fleshy, entire, oblong, blunt; the edges of the grooved lower half up-turned. *Column* with large broadly falcate hooked (inverted hatchet-shaped) apical processes, the foot short. *Anther* helmet-shaped, papillose; *pollinia* very unequal, the outer two narrowly reniform. Hook. fil. Fl. Br. Ind. V, 779.

Sikkim, at elevations of 5,000 to 7,000 feet; common; Pantling, No. 99; in flower during October and November. Khasia Hills, at Shillong; alt. 5,500 feet; C. B. Clarke.

The sepals of this are of a dull yellowish-green colour, changing to pale warm brown at maturity; the floral bract is straw-coloured, and the rest of the flower more or less purple with white blotches. In general appearance and coespitose habit it resembles *C. refractum*, having like it leaves in pairs, drooping racemes and dull greenish-yellow sepals. But the long upper sepal (more than half as long as the lateral pair) suggests *Bulbophyllum*, from which genus *Cirrhopetalum* is separated by only arbitrary and not very constant characters.

Plate 118. *Cirrhopetalum viridiflorum*, Hook. fil. A plant, *of natural size.* 1 Flower with its bract, *front view*, 2 stalked ovary, column and lip, *seen from the side*, 3 floral bract, opened out, 4 the petals, 5 lip, 6 anther, 7 column showing its large hooked processes, papillose anther *in situ*, and short foot, 8 pollinia; *all enlarged.*

2. CIRRHOPETALUM REFRACTUM, Zollinger in Flora, 1847, 456.

Coespitose; pseudo-bulbs conical with broad bases, short, wrinkled at flowering-time, crowded. *Leaves* two from the apex of a pseudo-bulb, deciduous at flowering-time, narrowly oblong, acute, contracted at the base, sessile, 3 to 5 in. long and ·7 to ·85 in. broad. *Scapes* 4 to 6 in. long; the peduncle erect or slightly decurved, slender, sheathed at the base and with two ovate-acuminate bracts; the raceme drooping, 1·5 to 3·5 in. long, 4- to 12-flowered; floral bract ovate-acuminate, several times longer than the short sessile ovary. *Flowers* 1·75 to 2·5 in. long, decurved. Dorsal *sepal* free at the base from the lateral pair, lanceolate, the apex awned; the margins ciliate, depressed; the lateral pair about five or six times as long as the dorsal, linear, sub-acute, sparsely ciliate, cohering except at the base. *Petals* rather fleshy, triangular, more densely ciliate than the dorsal sepal and only about half as long. *Lip* shorter than the dorsal sepal, very fleshy, oblong, obtuse; the lower surface convex, the upper smooth, deflexed from below the middle, the basal half with its edges upturned, the anterior half with tufts of purple glandular hairs, and also with long solitary hairs. *Column* short, with decurved slender apical teeth, the foot short and little curved, abruptly contracted about the middle. *Anther* papillose; *pollinia* obovoid, subequal. Walp. Ann. I, 776; Hook. fil. Fl. Br. Ind. V, 779; Ann. Bot. Gard. Calc. V, 19, t. 28. *C. Wallichii*, Lindl. in Wall. Cat. 1980, and in Bot. Reg. 1839, Misc. 72; and 1843 sub. t. 49 (not of Wall. Pl. As. Rar. I, 53, t. 67); *C. tripudians*, Par. and Reichb. fil. in Gard. Chron. 1876 (I) 816. *Bulbophyllum refractum*, Reichb. fil. in Walp. Ann. VI, 259. *B. tripudians*, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 154.

Sikkim; at altitudes of 4,000 to 6,000 feet; common; Pantling, No. 24; in flower during October and November. Westward to Kamaon; also in Burma and Java.

A curious plant with a very wide geographical distribution. The lateral sepals, which form by far the largest part of the flower, are pale green when young, but change to a pale warm brown with age. The dorsal sepal, petals and lip are pale yellow, much spotted with purple, and with thick purple hairs. The flowers have a pleasant but faint smell of hay.

PLATE 119. *Cirrhopetalum refractum*, Zoll. A plant, *of natural size*. Fig. 1 a flower, *seen from the front*, 2 ovary, column with anther *in situ*, foot and lip, *seen from the side*, 3 floral bract, 4 the petals, 5 lip, 6 column, with anther *in situ*, apical teeth and foot, 7 anther, 8 pollinia; *all enlarged*.

3. CIRRHOPETALUM CORNUTUM, Lindl. in Bot. Reg. 1838, Misc. 75; 1843, under t. 49.

Rhizome naked, ·25 to ·3 in. thick; pseudo-bulbs narrowly ovoid, compressed, 1 to 1·5 in. apart, 1·75 to 2 in. long. *Leaf* narrowly oblong, blunt, slightly and obliquely notched, narrowed at the base into the short channelled petiole; length 6 to 9 in., breadth 1·25 to 1·5 in.; *petiole* about ·75 in. *Scape* 4 to 6 in. long, rather slender, sheathed at the base and with several ovate bracts, sub-erect, the apex bearing a lax radiate umbel of 6 to 9 puberulous flowers about 1·5 in. long; floral bract lanceolate, much shorter than the stalked ovary. *Dorsal sepal* very convex, vaulted over the column, ovate, scabrid, sub-acute, ·25 in. long; lateral sepals narrowly lanceolate, falcate, acuminate, cohering except at the scabrid base and at the apex, 1·5 in. long, minutely ciliolate. *Petals* ovate, acute, 3-nerved, ciliolate. *Lip*

7. Cirrhopetalum Andersoni, Hook. fil. Ic. Plantar. t. 2055. (*not of Kurz*).

Rhizome naked, ·2 in. thick; pseudo-bulb elliptic or ovoid, smooth, with many slightly spreading fibres at the base, 1 to 1·25 in. long and 1·5 to 2 in. apart. *Leaf* oblong, tapering slightly to the sub-acute apex, the base rather suddenly narrowed, sessile or sub-sessile; length 3·5 to 5 in., breadth ·85 to 1·35 in. *Scape* somewhat shorter than the leaves, slender, the peduncle speckled with brownish-purple and bearing two lanceolate-oblong sheaths ·5 in. long. *Flowers* dorsally compressed, ·65 in. long, five or six in a radiate umbel; floral bract minute, oblong, acute, much shorter than the rather long-stalked ovary. Dorsal *sepal* oblong-ovate, shortly awned at the apex; the lateral pair three or four times as long as the dorsal, dimediate-oblong-obovate, falcate, the inner edges coherent, the apices blunt. *Petals* slightly longer than the dorsal sepals, broadly oblong, 3-nerved, the apices acute and awned, the edges slightly erose. *Lip* narrowly oblong, with blunt emarginate apex and entire edges, decurved from the middle. *Column* stout, thick, winged, apical teeth very short, the foot much curved. Lip of *anther* pectinate, *pollinia* elongate. Hook. fil. Fl. Br. Ind. V, 777.

Sikkim; Anderson; in the valley of the Teesta, at an altitude of about 1,500 feet; Pantling, No. 300; in flower in October.

The flowers are of a delicate pink, with minute spots of a darker tint. Collected only twice—once by the late Dr. T. Anderson, after whom it is named, and once by Mr. Pantling. In shape the flowers are very like those of *C. bootanense*, but the scapes are very much longer. This species also very closely resembles *C. gamosepalum*, Griff., which has, however, a scape decurved from its base.

Plate 124.—*Cirrhopetalum Andersoni*, Hook. fil. A plant; *of natural size*. Fig. 1 flower, 2 bract, stalked ovary, column, foot and lip of a flower which has probably been fertilised, *seen from the side*, 3 petals, 4 a complete lip and the emarginate apex of another, 5 column with anther *in situ* and foot, 6 anther, 7 pollinia; *all enlarged*.

8. Cirrhopetalum Sikkimense, King and Pantling, *n. species*.

Rhizome naked, about ·15 in. thick; pseudo-bulbs ovoid-globose, about ·5 in. apart and ·3 or ·4 in. long. *Leaf* very fleshy, oblanceolate, obtuse, obliquely notched, narrowed to the base, sessile or sub-sessile, 1·5 to 2 in. long. *Scape* shorter or very little longer than the leaves (about 2 in. long), sub-erect, with two sheathing bracts, and at the apex a radiating umbel of ten to twelve flowers about ·5 in. long; floral bract lanceolate, acuminate, shorter than the stalked ovary. Dorsal *sepal* about ·15 or ·2 in. long, free from the lateral pair at its base, concave, lying over the column, ovate-acute, the tip upturned and with several soft hairs on its edges; lateral sepals three or four times as long as the dorsal, narrowly oblong, very blunt, sub-falcate, coherent except at the bases; their apices obtuse, entire. *Petals* ovate, sub-acute, with very oblique bases, 3-nerved, the edges ciliate-aristate and with one strong long apical awn. *Lip* broadly ovate at the base, much narrowed in the anterior half, the apex obtuse, the edges entire; the upper surface smooth, slightly concave, having a slender raised line down its centre. *Column* broad, with short bidentate shoulders; the foot long, much curved. *Pollinia* very unequal, the inner two very small.

Sikkim; at the foot of the hills; common; Pantling, No. 148; in flower in May.

The dorsal sepal of this is greenish with a few brownish-red markings; the lateral sepals are ochraceous, minutely spotted with reddish-brown and with a few lines of the same colour near the base. The petals are ochraceous with three broad reddish-brown nerves and purplish marginal ciliæ. The upper surface of the lip is of the same colour as the lateral sepals, but darker. The anther is yellow and the column is white with a pink patch in front, marked with elongate brown dots. The ovary is greenish-yellow with brown spots. The nearest ally of this species is *C. Roxburghii*, Lindl., a species hitherto collected only in the Sunderbuns. It is also allied to *C. gamosepalum*, Griff., a plant common from Burma southwards to Malacca and not infrequent in the Andaman Islands. From *C. Roxburghii* this differs in its petals having only three nerves, much coarser marginal ciliæ, and a more obtuse apex terminated by a shorter awn; and in its lateral sepals being more obtuse, connate almost to the apex, and ochraceous with dots, instead of pure yellow. The scape of this is moreover shorter and the leaves not only shorter but also broader than is the case in *C. Roxburghii*.

PLATE 125.—*Cirrhopetalum Sikkimense*, King and Pantling. A plant; *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column and its foot, and the lip, 3 the petals, 4 lip, 5 column, its bidentate shoulders with anther *in situ*, and its foot, 6 anther, 7 pollinia; *all enlarged*.

9. CIRRHOPETALUM SARCOPHYLLUM, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, 335.

Rhizome ·1 in. thick, naked, remotely annular; pseudo-bulbs discoid, about ·15 or ·2 in. thick, ·3 or ·4 in. broad, and from 2 to 3 in. apart, each with a fringe of long fibres at its base. *Leaf* pendulous, very fleshy, oblong, sub-falcate, tapering to the acute apex and at the base to the thick terete petiole; length 5 to 9 in., breadth 1·25 to 1·5 in.; petiole ·75 to 1 in. *Scape* about half as long as the leaf; the peduncle sheathed at the base and bearing at intervals two lanceolate bracts. *Umbel* 3- to 7-flowered. *Flowers* ·75 in. long; floral bract ovate, acute, shorter than the stalked ovary. Dorsal *sepal* free at its base from the lateral pair, ovate, acuminate, concave, ·35 in. long, depressed; the lateral pair rather more than twice as long, falcate-lanceolate, sub-acuminate, cohering just under the apex for about one-third of their length, glandular-puberulous like the dorsal. *Petals* oblong, falcate, sub-acute, much shorter than the dorsal sepal. *Lip* oblong, deeply grooved in the basal half; the anterior half smooth, the apex sub-acute. *Column* stout, with two long erect subulate sub-divergent apical teeth; the foot short, very slightly curved, with two raised lines down its centre. *Pollinia* narrowly pyriform, the inner two less than half as large as the outer.

Sikkim; at elevations of from 3,000 to 5,000 feet; Pantling, No. 95; in flower from June to September according to elevation.

The sepals and petals are reddish-brown, much mottled; the lip is purple with deeper blotches. A species with a considerable vertical distribution. At low elevations it appears as a dwarf, and to this dwarf we have given the following varietal name.

Var. *minor*. Leaves 2 to 3 in. long; scape ·75 to 1 in., flower ·45 in. long.

Smaller in all its parts than the typical form, and found close to the plains at elevations of 1,000 feet; not connected with the type by transition forms.

PLATE 126.—*Cirrhopetalum sarcophyllum*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, *seen from the side*, 2 the same, *from the front*, 3, front of ovary, column with anther *in situ*, foot and lip, *side view*, 4 lip, 5 column with its apical processes, anther *in situ* and foot, 6 anther, *seen from below*, 7 pollinia; *all enlarged*; 8 transverse section of leaf, *of natural size*.

10. CIRRHOPETALUM COESPITOSUM, Wall. in Bot. Reg. 1838, Misc. 35.

Coespitose, pseudo-bulbs much crowded, ovoid, ·35 to ·5 in. long. *Leaf* linear-lanceolate, acute, the base narrowed to the petiole; length 2 to 4 in., petiole ·25 to ·75 in. *Scape* much shorter than the leaves, slender, erect, minutely bracteate, bearing at the apex an umbel of three to five flowers ·5 to ·7 in. long; floral bract lanceolate, much shorter than the long-stalked ovary. Dorsal *sepal* free at its base from the lateral pair, very concave, vaulted over the column, ovate, shortly acuminate; lateral sepals much longer than the dorsal (·75 in. or more), linear-lanceolate, obtusely acuminate, partly coherent, the bases and apices free, the edges erose. *Petals* broadly ovate, acute, the edges erose-dentate. *Lip* oblong, sub-acute, entire, fleshy, very concave near the base. *Column* thick, with minute sharp triangular apical processes; the foot rather long, much curved; *pollinia* laterally compressed, unequal, the inner two minute. Lindl. in Bot. Reg. 1843, under t. 49; Hook. fil. Fl. Br. Ind. V, 775; in Ann. Bot. Gard. Calc., Vol. V, pt. 18, t. 27. *B. confertum*, Hook. fil. Ic. Plant., t. 2035; Fl. Br. Ind. V, 757. *Bulbophyllum scabratum*, Reicbh. fil. in Walp. Ann. VI. 259.

Sikkim; at elevations of about 4,000 feet; Pantling, No. 110; in flower during April. Khasia Hills; Gibson, Griffith, G. Gammie.

The flowers are of a pale ochreous yellow; the nerves of the sepals and petals being coloured and flexuous.

PLATE 127.—*Cirrhopetalum coespitosum*, Wall. A plant; *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ*, the foot and the lip, 3 lip, 4 column and its foot, 5 anther, 6 pollinia; *all enlarged*.

11. CIRRHOPETALUM PARVULUM, Hook. fil. Ic. Plantar., t. 2060 A.

Rhizome slender, annulated, ·1 in. thick; pseudo-bulbs ovoid, ·35 to ·75 in. long, sometimes touching, sometimes ·25 to ·5 in. apart. *Leaf* narrowly elliptic, sub-acute, narrowed at the base, sessile, 1 to 1·25 in. long. *Scape* as long as the leaf or longer, erect, slender, sheathed only at the base, bearing at the apex three or four flowers in a short raceme. *Flowers* ·6 in. long, drooping; floral bract lanceolate, acuminate, equalling the stalked ovary. Dorsal *sepal* oblong-ovate, acute, free at its base; the lateral pair two and a half times as long as the dorsal, linear-oblong, somewhat falcate, acuminate, diverging. *Petals* ovate, acute, obscurely erose. *Lip* oblong, tapering to the sub-acute apex, decurved from below the middle, the upper surface with a deep mesial groove from the base to near the apex. *Column* with short triangular erect teeth; the foot much curved, elongate. *Anther* minutely papillose; the *pollinia* elliptic, the inner two small. *Capsule* nearly ·5 in. long, fusiform, ellipsoid, smooth, stalked. Hook. fil. Fl. Br. Ind. V, 778. *C. Dyerianum*, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, 335.

Sikkim; Griffith, G. Gammie; Pantling, No. 342; at elevations of 7,000 to 9,000 feet; in flower in August.

PLATE 128.—*Cirrhopetalum parvulum*, Hook. fil. A plant; *of natural size.* Fig. 1 a flower, 2 bract, stalked ovary, column, foot and lip, *seen from the side*, 3 petals, 4 lip, 5 column with anther *in situ* and the curved foot, 6 anther, 7 pollinia; *all enlarged.*

12. CIRRHOPETALUM CAUDATUM, King and Pantling (*not of Wight*).

Rhizome filiform, naked, less than ·1 in. in diam. *Pseudo-bulbs* ovoid, compressed, furrowed, ·4 or ·5 in. long and an inch or more apart. *Leaf* coriaceous, ovate-lanceolate, acute, ·75 to 1 in. long and ·3 to ·4 in. broad, sessile or sub-sessile. *Scape* stout, its peduncle equalling or slightly exceeding the pseudo-bulb, bearing several sheaths near its base. *Flowers* dorsally depressed, umbellately capitate, ·8 to 1·35 in. long (to the tips of the lateral sepals), radiating; floral bract lanceolate, as long as the stalked ovary. Dorsal *sepal* ·15 to 2 in. long, oblong-ovate, acuminate, vaulted over the column; the lateral pair five to seven times as long, lanceolate, with elongated filiform tips, parallel or divergent, nowhere cohering. *Petals* oblong-obovate, blunt. *Lip* about as long as the petals, oblong, stipitate, with erect rounded side lobes connected at the base by a transverse bar, the anterior half with its edge decurved all round. *Column* short, broad, with two pairs of short apical teeth, the upper pair slender, the lower pair broader and incurved. *Anther* papillose. *Bulbophyllum caudatum*, Lindl. in Wall. Cat. 1983; Gen. and Spec. Orchid., 56; Hook. fil. Fl. Br. Ind. V, 759.

Sikkim; at elevations from 1,500 to 6,000 feet; Pantling, No. 50; in flower during June and July.

The flowers are white, the sepals and petals being semi-transparent when fresh. This species has the umbellate inflorescence, the comparatively short dorsal sepal, and the elongated lateral sepals which are the only tangible characters by which *Cirrhopetalum* is distinguished from *Bulbophyllum*. We have therefore removed it from the latter to the former genus. In the Lindley Orchid Herbarium preserved at Kew, there is a coloured drawing (No. 1132 without specimen) named in Lindley's own hand-writing "*Bulbophyllum caudatum*." This has much shorter lateral sepals than the plant here figured, but in other respects it agrees well with it. The shortness of the sepals depicted in Lindley's drawing may be accounted for by the points, which are extremely thin and fragile, having been broken off. It is possible, however, that they never were longer; for there is considerable variation as to the length of the lateral sepals in the species of *Cirrhopetalum* (*e.g. C. ornatissimum* in which they are prolonged into hair-points). The plant named *C. caudatum* by Wight is really *C. vaginatum*, Lindl., and is a Malayan species.

PLATE 129.—*Cirrhopetalum caudatum*, King and Pantling. A plant; *of natural size.* Fig. 1 a flower, 2 stalked ovary, column, anther *in situ*, foot and lip, 3 the petals, 4 lip, half profile view, 5 column with the anther *in situ* and foot, 6 anther, 7 pollinia; all *enlarged.*

13. CIRRHOPETALUM ELATUM, Hook. fil. Ic. Plantar., t. 2052.

Coespitose; pseudo-bulbs cylindric, tapering to the apex, 2 to 3 in. long, usually of a dull copper colour. *Leaf* narrowly oblong, obtuse, slightly notched, tapering to the

base, sessile or sub-sessile, 8 to 10 in. long and 1 to 1·25 in. broad. *Scape* as long as the leaves, slightly decurved, slender, speckled with purple, and with two or three small bracts; umbels many-flowered. *Flowers* about ·75 in. long, radiating; floral bract much shorter than the stalked ovary. Dorsal *sepal* free at its base from the lateral pair, broadly ovate, sub-acute, depressed, the lateral pair three or four times as long as the dorsal, narrowly oblong, falcate, sub-acute, not cohering. *Petals* falcately triangular, with oblique bases. *Lip* oblong, tapering to the sub-acute apex, entire, the base slightly dilated, the upper surface with a shallow mesial groove on its basal half. *Column* slightly winged; the apical teeth minute, decurved; the foot slender, much curved. Hook. fil. Fl. Br. Ind. V, 775.

Sikkim; at elevations of 5,000 to 6,000 feet; Clarke, Gamble; Jaldacca valley, 6,000 feet; Pantling, No. 160; in flower in May.

The flowers are of a dirty yellow, spotted with purple. This is closely allied to *C. picturatum*, G. Lodd,—a Burmese species which, however, has awned dorsal sepals, erose petals, and a column with long subulate apical teeth.

PLATE 130.—*Cirrhopetalum elatum*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 petals, 3 bract, long-stalked ovary, column with the anther *in situ*, foot and lip, *seen from the side*, 4 lip, 5 column, showing its narrowly winged sides and small apical teeth, the anther and the slender curved foot, 6 anther, 7 pollinia; *all enlarged*.

14. CIRRHOPETALUM GUTTULATUM, Hook. fil. Fl. Br. Ind. V, 776.

Pseudo-bulbs coespitose, crowded, ovoid, tapering much to the apex, 1 to 2 in. long. *Leaf* elliptic-oblong, sub-acute, tapering much to the channelled petiole; length 3 to 6 in., breadth ·8 to 1·25 in.; petiole ·5 to ·75 in. *Scape* equalling or exceeding the leaf, decurved, spotted with purple, with two sheathing bracts at the base and several scattered along the peduncle. *Flowers* about ·75 in. long, in umbels of 6 to 9 on long pedicels; floral bract ovate, acuminate, much shorter than the long pedicel of the ovary. Dorsal *sepal* free at its base from the lateral pair, broadly ovate, apiculate, very concave, vaulted over the column; lateral sepals free, about twice as long as the dorsal, ovate-lanceolate from a broad base, sub-falcate, sub-acute, their upper margins incurved, cohering only at the base, the apices divergent. *Petals* broadly elliptic, shortly apiculate, shorter than the dorsal sepal, spreading. *Lip* deflexed from the middle, oblong with a very broad base, the apex minutely emarginate; the under surface with a grooved keel. *Column* stout, with broad rectangular wings, the apical teeth long, filiform, decurved; the foot rather long, its apex upturned. *Pollinia* ellipsoid, attached to a ball of viscid cheesy matter, the inner two very small. *Bulbophyllum umbellatum*, Lindl. in Wall. Cat. 1984; in Bot. Reg. 1845, t. 44; Bot. Mag. t. 4267; Reichb. fil. in Walp. Ann. VI, 264. *B. guttulatum*, Wall. MSS.

Sikkim; at altitudes of from 2,000 to 5,000 feet; not uncommon; Griffith (No. 5180, Kew Distrib.); Pantling, No. 53. Nepal; Wallich. Khasia and Assam Hill Ranges; in flower from July to September.

The flowers of this are of a pale yellow, beautifully spotted with purple, the lip being almost entirely purple. What is probably this species has been recently collected in the Shan States in Burma, but the specimens are not in flower. This much resembles *C. maculosum*, Lindl., but has longer scapes and much longer columnar processes.

PLATE 131.—*Cirrhopetalum guttulatum*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 bract, the long-pedicelled ovary, the column and lip *seen from the side*, 3 lip, 4 column with the anther *in situ* and the foot, 5 anther, under surface, 6 pollinia; *all enlarged*.

15. CIRRHOPETALUM MACULOSUM, Lindl. in Bot. Regist. 1841, Misc. 81; 1843, *under* t. 49.

Rhizome with fibrous sheaths and many roots, about ·2 in. thick; pseudo-bulbs touching or as much as ·5 in. apart, ovoid, shrivelled, ·75 to 1 in. long. *Leaf* thick, narrowly oblong, the apex obtuse and notched, narrowed at the base, sessile, 4·5 to 6 in. long and ·65 to 1·25 in. broad. *Scape* about twice as long as the pseudo-bulbs, with a sheath at the base, the umbel two- to four-flowered; floral bract lanceolate, shorter than the stalked ovary. *Flowers* about ·4 in. long. Dorsal *sepal* free at its base from the lateral pair, broadly ovate, acute, sub-depressed; lateral sepals about twice as long as the dorsal, free, ovate-lanceolate from a broad base, sub-acute, falcate, their upper margins curved inwards. *Petals* broadly ovate, very obtuse. *Lip* oblong with a broad base, tapering to the sub-acute apex, the upper surface with a groove and a line in the middle of it. *Column* broadly winged, short; the apical teeth short, curved, blunt; the foot narrowed, rectangularly curved below the apex, otherwise rather straight. *Pollinia* unequal, the outer two much the larger, all cohering to a mass of viscid tissue. Hook. fil. Fl. Br. Ind. V, 776. *C. bootanense*, Griff. Notul. III, 297; Ic. Pl. t. 299. *Bulbophyllopsis maculosa*, Reichb. fil. in Walp. Ann. VI, 243. *B. morphologorum*, Reichb. fil. in Bot. Zeit. 1852, 933.

Sikkim; at Tendong; elevation 5,000 feet; Pantling, No. 208; in flower in May. Distributed westward to Nepal, Kumaon and Gharwal; Falconer, Strachey and Winterbottam and other collectors. Khasia Hills; Mrs. Prain.

The sepals and petals are cream-coloured, profusely spotted; the lip is green, and the foot of the column blotched with red. This is allied to *C. guttulatum*, Hook. fil. As in the case of *C. ornatissimum*, the pollinia adhere to a viscus. The Sikkim plant has been made a variety by Sir Joseph Hooker under the name of var. *fuscescens*.

PLATE 132.—*Cirrhopetalum maculosum*, Lindl. A plant; *of natural size*. Fig. 1 a flower with its stalked ovary and bract, *side view*, 2 front of ovary, column with its foot and the lip, *seen from the side*, 3 lip, 4 column, half front view to show the wings and apical processes, the anther *in situ*, and the foot, 5 anther, 6 pollinia; *all enlarged*.

16. CIRRHOPETALUM ORNATISSIMUM, Reichb. fil. in Gardn. Chron. 1882, II, 424.

Rhizome naked, about ·15 in. thick; pseudo-bulbs narrowly ellipsoid, about 1 in. apart and 1 in. in length. *Leaf* oblong, the apex obtuse and slightly notched, the base slightly narrowed, sessile, 2·25 to 4 in. long. *Scape* about 3 in. long, rather stout, bearing one sheathing bract at the base and one free lanceolate one about the middle, and a solitary flower at the apex; floral bract lanceolate, shorter than the sub-sessile ovary. *Flower* (to the ends of the lateral sepals) 7 or 8 inches in length. Dorsal *sepal* (including its tail) about ·7 in. long, erect, ovate, 3-nerved, the apex prolonged into a long drooping filiform appendage bearing hairs on its edges

in its lower half, and irregular sub-cuneate deeply erose red paleæ in its upper; the lateral pair widely separated at their bases from the dorsal, lanceolate, from 4 to 7 inches long, the filiform tips twisted into a tail, their apices free. *Petals* subulate-lanceolate, falcate, 1-nerved, with filiform pale-bearing apices like the dorsal sepal and of about the same length. *Lip* oblong, obtuse, decurved from the very concave base; the area between the upturned edges flat and with three raised lines, the outer two sinuous, the central one straight. *Column* broad with hooked decurved apical teeth, dentate at their bases; the foot curved, tapering. *Anther* pubescent in front; *pollinia* oblong, compressed, attached to a ball of viscid matter. Warner Orchid. Alb. t. 369; Hook. fil. Fl. Br. Ind. V, 773.

Sikkim, in warm valleys; Pantling, No. 197; in flower during October and November.

The colour of the flowers is yellowish-green with purple markings; the paleæ and lip are dark purple. The lateral sepals in the plant from which the drawing was made measured 7 inches in length. The flowers have a very unpleasant odour. The nearest allies of this are the Burmese *C. Collettii*, Hemsl., and the Malayan *C. vaginatum*, Lindl.

PLATE 133.—*Cirrhopetalum ornatissimum*, Reichb. fil. A plant; *of natural size.* Fig. 1 dorsal sepal, 2 petals, 3 paleæ from the petals, 4 bract, ovary, column with the anther *in situ* and lip, 5 lip, 6 column, showing its decurved apical processes, foot, and the lip, 7 anther, 8 pollinia and viscus; *all enlarged.*

8. Anthogonium, Lindl.

Terrestrial, slender; pseudo-bulb small, partly buried in the soil, bearing at the apex a short 2- to 5-leaved stem. *Leaves* membranous, linear, plicate, sessile, sheathing. *Scape* from the side of the pseudo-bulb, exceeding the leaves, bearing a simple or slightly branched terminal lax raceme of resupinate flowers rather more than ·5 in. long, gibbous at the base. *Sepals* connate in their lower half into a narrow cylindric tube; the upper halves free, oblanceolate, spreading. *Petals* elongate-spathulate, their narrow bases included in the sepaline tube. *Lip* adnate to the base of the column, convolute, embracing the column; the basal part narrow, the anterior part slightly expanded, and the mouth obscurely 3-lobed. *Column* long, slender, its apex dilated and abruptly bent, not winged and with no foot. *Anther* 4-celled; *pollinia* 4, in one row, unequal, without membrane or viscus. A single species.

ANTHOGONIUM GRACILE, Lindl. in Wall., Cat 7398; Gen. and Spec. Orchid., 426.

Pseudo-bulb ovoid. *Stem* 4 in. long, sheathed at the base, bearing 2 to 5 membranous, many-nerved, acuminate leaves, not petiolate, but sheathing at the base, 6 to 12 in. long and ·4 to ·7 in. broad. *Scape* longer than the leaves, rising from the side of the pseudo-bulb, slender, erect, bearing several short tubular sheaths ·5 in. long. *Raceme* 3 to 6 in. long, sometimes with a branch, sparsely flowered. *Flowers* ·6 to ·75 in. long, often at a wide angle with the long-stalked ovary; the bract lanceolate, minute. Tube of the perianth longer than the free parts; anterior part of the lip cuneate, the apex tri-lobulate. *Pollinia* four in a single row, unequal,

without either membrane or gland. *Capsule* 1 in. long, fusiform. Lindl. in Journ. Linn. Soc. III, 22. *A. Griffithii*, Reichb. fil. in Bonplandia, II, 90; in Allg. Gartenzeit, for 1856, 218; in Walp. Ann. VI, 471; Hook. fil. Fl., Br. Ind. V. 823. *Anthogonium*, Griff. Notul. III, 383; Ic. Pl. Asiat. t. 345.

Sikkim; at elevations of from 4,000 to 7,000 feet, common; Pantling, No. 54. flowering during August and September. Distributed westward along the Himalaya to Nepal and in the Khasia and Naga Hills; also in Burma.

The flowers are rose-coloured, the lip being white towards the apex, with dark purple spots, and the anther a brilliant yellow. A white-flowered variety is not uncommon.

PLATE 134.—*Anthogonium gracile*, Lindl. A plant; *of natural size*. Fig. 1 flower, 2 bract, ovary and lip, *in profile*, the sepals and petals having been removed, 3 lip, spread out, 4 upper part of columu with anther *in situ*, 5 under surface of anther, 6 pollinia; *all enlarged*.

9. Chrysoglossum, Blume.

Terrestrial with creeping rhizome, pseudo-bulbs narrow. *Leaf* solitary, plicate, membranous, elliptic-lanceolate. *Scape* from the rhizome near the pseudo-bulb, erect the *raceme* lax. *Sepals* sub-equal, spreading, the lateral pair connate into a mentum with the base of the lip. *Petals* slightly broader than the sepals. *Lip* usually auricled near the base, adpressed to the column and adnate to its foot, deflexed below the middle, 3-lobed, 3-lamellate. *Column* slender, with a very small spur, its sides auriculate about the middle, sometimes lamellate in front. *Anther* triangular, 2-celled; *pollinia* 2, free, sub-globose or unequally four-sided.

A genus for a long time supposed to be confined to the Malayan region, but, as discovered by Sir Joseph Hooker, quite as much Indian as Malayan, there being two species now known from India, and one from Ceylon, besides the two Malayan originally described by Blume. This genus resembles *Tainia* and *Plocoglottis* in habit, and to some extent *Eulophia* also. It is characterised by its bi-auriculate column, small mentum (formed by the union of the bases of the column, lip and lateral sepals); 3-lobed lip with a large auriculated base adnate to the column (not jointed); and perfectly free, sub-globular or angled pollinia, and membranous plicate leaves.

CHRYSOGLOSSUM ERRATICUM, Hook. fil. Ic., Plantar., t. 2062.

Pseudo-bulb narrowly ovoid, tapering much to the apex, about 3 in. long. *Leaf* tapering to each end, about 12 in. long and 4 in. broad; petiole 4 in. *Scape* about as long as the leaf, with three or four sheathing bracts about ·75 in. long. *Flowers* few, about ·8 in. across; *floral bract* lanceolate, shorter than the long-stalked ovary. *Sepals* linear-oblong, sub-acute, the lateral pair falcate. *Petals* oblong, obtuse, very falcate. *Lip* with a broad base hastately 3-lobed, the lateral lobes rounded, the apical lobe sub-acute with upturned margins. *Disc* with three lamellæ, the central one shorter, the two lateral diverging at their apices. *Column* with two projecting rounded lobes on its margins below the middle, and a short spur at its base; the face grooved and with two lamellæ near the base and above the entrance to the spur. *Anther* apiculate.

Sikkim; at Rishap; C. B. Clarke. Bhotan, in the valley of the Gheet, at an elevation of from 3,000 to 5,000 feet; Pantling, No. 83; in flower during June.

The sepals and petals are green, minutely spotted with brown; the lip is white with a yellow spot at its base and reddish spots on the edges of the side and apical lobes; the column is yellow with a white blotch.

PLATE 135.—*Chrysoglossum erraticum*, Hook. fil. A plant; of *natural size*. Fig. 1 the sepals and petals, detached, 2 ovary and column, showing its short spur and the lip, *side view*, 3 lip, 4 the base of the lip, showing the yellow auricles, 5 column with the anther *in situ*, 6 anther, 7 pollinia; *all enlarged*.

10. Diglyphosa, Blume.

Terrestrial with creeping rhizome and long narrow pseudo-bulbs, each bearing a solitary, membranous, elliptic, plicate, petiolate leaf. *Scape* lateral near the base of the pseudo-bulb, erect; the *raceme* many- and densely-flowered, with a thick rachis. *Sepals* broadly lanceolate, the lateral pair and the *petals* falcate. *Lip* jointed to the foot of the column, mobile, oblong, bilamellate from base to apex, with obscure basal but no lateral lobes; the apical lobe narrow. *Column* with a foot half as long as itself, but without lateral wings or auricles. *Anther* with two projecting triangular wings; *pollinia* 2, elliptic, slightly obovate, sometimes attached to a small mass of adhesive matter. Distrib. two species, one Malayan and one British Indian.

A genus closely allied to *Chrysoglossum*, but differing from it in the column having rather a long foot, but neither wings nor auricles; in the pollinia being elliptic and slightly clavate (instead of sub-globular or unequally 4-sided); in the petals and sepals being much broader; in the lip being without basal or side lobes; and in the raceme being many- and densely-flowered, and having a thick rachis and large persistent coloured bracts. The genus was first founded by Blume in his Bijdragen (p. 336 t. 60). The same author again described and figured in his Flora Javæ (Orchid. 138, t. 60) the only species known to him (*D. latifolia*). In the text of the Flora Javæ, Blume changed the name of the genus to *Diglyphis*, retaining that of *Diglyphosa* in his figure. The older name must of course stand.

DIGLYPHOSA MACROPHYLLA, King and Pantling.

Pseudo-bulb sub-cylindric, broadly elliptic, thin, 6 in. long. *Leaf* plaited, slightly narrowed at base and apex, 15 in. long and 7 in. broad; its petiole 8 in. long. *Raceme* about 6 in. long, many-flowered, its stalk about 12 in. long, sparsely bracteolate. *Flower* ·5 in. across; the ovaries ·5 in. long; *bract* lanceolate, reflexed, shorter than the stalked ovary. *Sepals* sub-equal, the dorsal lanceolate, the laterals falcate. *Petals* slightly broader than the sepals, falcate. *Lip* contracted into a claw at the base, mobile, oblong, abruptly decurved from the obscure rounded basal lobes, the apex minutely emarginate and decurved; upper surface with two bold longitudinal minutely hispid lamellæ running from the base to nearly the apex where they unite. *Mentum* none. *Anther* with two projecting triangular wings. *Pollinia* 2, attached to a small viscus. *Chrysoglossum macrophyllum*, King and Pantling, in Journ. As. Soc. Bengal, Vol. XLIV, pt. 2, 335.

Sikkim; in the Chel valley, at an elevation of 4,000 feet; in flower in May; Pantling, No. 315.

The colour of the flowers is golden-brown throughout, that of the scape and rachis is purple. The flowers have an unpleasant smell. The only other species of the

genus is *D. latifolia*, Bl., of which the flowers are yellowish, tinged with purple, the floral bracts being of a dull brownish-grey colour.

PLATE 136.—*Diglyphosa macrophylla*, King and Pantling. Pseudo-bulb, part of a stem and of a peduncle and an entire raceme; *of natural size.* Fig. 1 sketch of an entire plant, *much reduced in size*, 2, flower, 3 floral bract, stalked ovary, column and lip, *side view*, 4 lip, 5 column with its foot and anther *in situ*, 6 anther, *side and front view*, 7 pollinia; *all enlarged.*

Tribe II.—EPIDENDREAE.

Pollinia 4 or 8, waxy, attached by their bases or by their backs to a single or double granular or translucent appendage, but without any gland derived from the stigma.

Terrestrial, with or without pseudo-bulbs, leaves membranous, plicate; inflorescence axillary or scapiform; lip lamellate, 3-lobed, column long, pollinia 8.

Leaves linear from a slender pseudo-stem; inflorescence racemose, the peduncle long and slender, column without a foot, lip never spurred (saccate in *Pachystoma*).

Lip sessile, with horizontal lamellæ, not saccate; column hooded, nearly straight, leaves and flowers contemporaneous . . . . . *11. Spathoglottis.*

Lip sessile, saccate at the base, lamellæ ridge-like and carunculate; column dilated towards the apex, but not hooded, leaves not contemporaneous with the flowers . *12. Pachystoma.*

Leaves elliptic, ovate or cordate, solitary from a pseudo-bulb or lateral from a stem, petiolate or sub-sessile; inflorescence scapiform or terminal from a stem; column with or without a foot, sometimes spurred.

Sepals and petals sub-equal, all free.

Lateral sepals inserted on the short foot of the column; lip not convolute, rarely spurred; pseudo-bulbs 1-leaved; leaves elongate, long-petioled . . . . *13. Tainia.*

Lateral sepals inserted on the long foot of the column and forming with it a mentum, or column without foot and lip spurred; pseudo-bulbs when present, 1-leaved; leaves ovate or cordate, sub-sessile . . . *14. Nephelaphyllum.*

Lateral sepals inserted on the base of the footless column; lip spurred, convolute above the column, the mouth large and with undulate edges; pseudo-bulb with a many-leaved short pseudo-stem; leaves sub-sessile . . . . . *15. Phajus.*

Sepals cohering into a ventricose tube, their apices only free. Petals free, included except their apices; foot of column very long and bent at a right angle; the lip mobile . . . . . *16. Acanthephippium.*

Terrestrial, with tall reed-like many-leaved stems and no pseudo-bulbs; inflorescence terminal, panicled; lip sessile, not spurred, its base convolute and embracing the column; pollinia 8, unequal . . . . *17. Arundina.*

Epiphytal, either with or without pseudo-bulbs; leaves membranous or fleshy; inflorescence lateral or terminal; lip usually lamellate, column with a long foot, flowers with a mentum; pollinia 8, sub equal, all cohering, or cohering by fours to a common membrane.

Column straight, short; lip oblong, not mobile.

Sepals connate, petals included except their apices; pseudo-bulbs small, discoid, reticulate; flowers one or two, terminal. *18. Porpax.*

Sepals and petals free, spreading; pseudo-bulbs when present not discoid; inflorescence lateral or terminal, racemose or capitate . . . . . *19. Eria.*

Column long, curved, arching so that its apex is brought opposite the middle of the lip; its foot much thickened, coloured; lip orbicular, mobile; racemes lateral . . . . . *20. Tylostylis.*

Epiphytal, with pseudo-bulbs or jointed stems, cœspitose or with a rhizome; leaves in pairs, membranous; inflorescence terminal or scapiform, racemose; column usually long (short in some species of *Pholidota*) with no foot; pollinia 4, in free pairs, or all cohering to a common membrane.

Pseudo-bulbous.

Lip not clawed and not sigmoidly bent at the base; disc of lip lamellate . . . . . *21. Cœlogyne.*

Lip clawed and boldly sigmoid at the base; disc of lip not lamellate . . . . . *22. Panisea.*

Stems composed of elongate pseudo-bulb-like joints strung end to end on a woody core.

Sepals narrow; lip narrow and deflexed, saccate at the base; floral bracts caducous . . . . . *23. Otochilus.*

Sepals broad, lip broad and erect, not saccate at the base; floral bracts persistent . . . . . *24. Pholidota.*

11. Spathoglottis, Blume.

Terrestrial; pseudo-bulbs broadly ovoid. *Leaves* on short stems, long, narrow, many-nerved. *Scape* lateral, bearing a few rather large flowers in a *raceme*. *Sepals* and *petals* sub-equal, free, spreading. *Lip* sessile on the base of the column, erect, usually saccate at the base; lateral lobes divergent, the disc between them ridged or tubercled; terminal lobe large. *Column* long, erect, winged toward the apex, with no foot. *Anther* 2-celled. *Pollinia* 8, cohering to a small membrane. Species about ten, in the tropics of Asia, in tropical Australia and the islands of the Pacific.

Spathoglottis ixioides, Lindl. in Wall. Cat. 3745; Gen. and Spec. Orch., 120.

Pseudo-bulbs globular, ovoid, ·6 to ·75 in. long, with numerous loose sheath-like fibres at their bases. *Leaves* two or three on a short sheathed stem from the apex of the pseudo-bulb, linear, acuminate, with several nerves, 4 to 8 in. long and about ·2 or ·25 in. broad. *Scape* from the side of the pseudo-bulb, erect, slender, longer or shorter than the leaves, with a long sheath at the base and bearing three or four flowers in a lax *raceme* at the apex. *Flowers* yellow, 1·5 in. in vertical expanse, puberulous; *floral bract* lanceolate,

shorter than the puberulous long-stalked ovary. *Sepals* and *petals* sub-equal, spreading, elliptic, oblong, sub-acute. *Lip* sessile on the column, erect, oblong, sub-saccate or concave at the base, 3-lobed; the side lobes conical, bifid, diverging; the terminal lobe obcordate, the disc between the side lobes with two elongate dimidiate calli separated by a mesial ridge passing forwards to the terminal lobe. *Column* elongate, dilated into wings towards the apex. *Anther* 2-celled. *Pollinia* 8, narrowly clavate, cohering in fours to a small membrane. Lindl. in Journ. Linn. Soc. III, 22; Hook. fil. Fl. Br. Ind. V, 814. *Pachystoma Josephi*, Reichb. fil. in Walp. Ann. VI, 464. *Cymbidium ixioides*, Don Prod. 36.

Sikkim, in the Lachoong valley, elevation 10,000 feet, Hooker, Elwes; Pantling No. 405; in flower during July and August. Nepal; Wallich, Scully.

The flowers are of a bright pale yellow, the lower half of the lip having numerous minute red spots.

PLATE 139.—*Spathoglottis ixioides*, Lindl. A group of plants; *of natural size*. Fig. 1 lip, 2 column with anther *in situ*, 3 empty anther, lower surface, 4 pollinia; *all enlarged*.

12. Pachystoma, Blume.

Terrestrial, with rather thick rhizomes. *Leaves* solitary or in pairs, following the flowers, long, narrow, many-nerved. *Scapes* pale, leafless but with many sheaths; flowers white or pale purple, puberulous, rather small, in crowded *racemes*. *Lip* sessile on the footless column, erect, with oblong acute side lobes and small terminal lobe. *Column* short, dilated at the apex. *Anther* dorsal. *Pollinia* 8, pyriform, adhering to a single membrane. About six or eight species, Asiatic or African.

PACHYSTOMA SENILE, Reichb. fil. in Bonplandia, III, 251.

Terrestrial, leafless at flowering time. *Rhizome* rather stout, producing scapes at intervals of 2 inches. *Leaf* succeeding the flowers, solitary, membranous, linear, 4- or 5-nerved, longer than the scape. *Scapes* about a foot high, very pale, clothed with numerous membranous clasping striate sheaths each 1 to 2 inches long; the *raceme* occupying the upper fourth, many-flowered. *Flowers* about ·5 in. across, glandular-puberulous; *floral bract* lanceolate, acuminate, erect, longer than the curved stalked pubescent ovary. *Sepals* unequal; the dorsal oblong, elliptic, blunt; the lateral pair oblong-lanceolate, sub-acute, all spreading. *Petals* narrowly spathulate, recurved, puberulous like the sepals. *Lip* sessile on the base of the column, erect, broadly oblong, 3-lobed, the base gibbous and pubescent, the side lobes with acute falcate apices; the terminal lobe orbicular, short, recurved, the disc of the whole lip from base to apex occupied by five stoutly crested ridges. *Column* dilated at the apex, puberulous. *Anther* on the back of the column, indistinctly 8-celled. *Pollinia* 8, sub-clavate, cohering to a single cylindric appendage. Reichb. fil. in Walp. Ann. VI, 463; Hook. fil. Fl. Br. Ind. V, 812. *P. Smithianum*, *P. montanum* and *P. Lindleyanum*, Reichb. fil. l. c.; and in Walp. Ann. VI, 462-463. *P. Edgeworthii*, Reichb. fil. Walp. Ann. VI, 463. *Apaturia senilis*, *A. Smithiana* and *A. montana*, Lindl. in Wall. Cat. 3739, 3737, 3738; Gen. and Spec. Orchid., 130, 131. *A. Lindleyana*, Wight Ic. Plant. t. 1662.

At the base of the Sikkim-Himalaya; Pantling No. 432; in flower during March. Extending along the base of the Himalaya westward to Gharwal. In the Khasia Hills, the base of the ranges of Peninsular India and of Ceylon, the Malay Archipelago and S. China.

The flowers are greenish-white, often flushed with pink; the terminal lobe of the lip being purplish. There is some variation in the size of the bracts which sheath the scape, but the variations are not constant.

PLATE 140.—*Pachystoma senile*, Reichb. fil. Rhizome, flowering scape and leaf; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther and lip, *seen from the side*, 3 lip, 4 part of ovary, column showing the stigma and the end of the dorsal anther, 5 lower surface of anther, 6 pollinia; *all enlarged*.

13. Tainia, Blume.

Terrestrial, glabrous, pseudo-bulbous. *Leaf* solitary, petiolate, membranous, many-nerved. *Scape* tall, erect, originating from the base of the pseudo-bulb. *Flowers* racemose, rather small and of a dull colour. *Sepals* and *petals* sub-equal, narrow; the lateral sepals falcate, forming with the short foot of the column a small blunt mentum. *Lip* more or less hastately 3-lobed, the lateral lobes small, the terminal broad, the disc with several lamellæ. *Column* slightly winged towards the apex. *Anther* short, broad, with two blunt often highly coloured bosses. *Pollinia* 8, unequal, united in fours to a granular membrane. Species eighteen or twenty, Indo-Malayan and Chinese.

Pseudo-bulbs narrowly fusiform.

Scape as long as or slightly longer than the narrowly elliptic leaves . . *1. T. minor.*
Scape at least twice as long as the broadly elliptic leaves . . . . . *2. T. latifolia.*

Pseudo-bulbs ovoid.

Leaves narrowed at the base . . . . . *3. T. Hookeriana.*

1. TAINIA MINOR, Hook. fil. Ic. Plantar., t. 2091.

Rhizome stout, with woolly roots. *Pseudo-bulbs* narrowly fusiform, inclined, about 1·5 in. apart, oblique, slightly curved, 1·5 to 1·75 in. long, often covered with a fibrous sheath. *Leaf* plicate, membranous, narrowly elliptic, tapering to each end, 5 or 6 in. long, and 1·5 to 2·25 in. broad; petiole channelled, 2 to 2·5 in. long. *Scape* from the base of the pseudo-bulb, erect, slender, as long as or longer than the leaf, tuberous at the base and enveloped in several unequal tubular sheaths; the *raceme* occupying the upper half and bearing seven or eight distant flowers ·6 in. long; *floral bract* linear-lanceolate, slightly shorter than the stalked ovary. *Sepals* free, spreading, narrowly oblong, blunt, the lateral pair sub-falcate. *Petals* like the lateral sepals, all 3-nerved. *Lip* narrowly cuneate-elliptic, 3-lobed, the lateral lobes far forward, small, sub-acute; the terminal lobe broad, short, erose, obtuse, its upper surface with five narrow unequal ridges; the disc between the side lobes with three broad lamellæ. *Mentum* short, blunt. *Column* slightly winged towards the apex, the foot very short. *Anther* short, broad, with two obtuse bosses. *Pollinia* unequal, cohering in fours to a granular membrane. Hook. fil. Fl. Br. Ind. V, 821.

Sikkim, on Mahalderam peak, elevation 6,000 feet; King, Clarke; Pantling No. 210; also at Choonthang; in flower during July. Bhutan; Biermann.

The sepals, petals, ovary and rachis of the raceme are of a purplish-brown, the two former being streaked with a darker shade; the lower half of the lip is white, speckled towards the sides with brownish-purple, the anterior part being yellow. The column and anther are green. Specimens of this are mixed with the species issued by Wallich as No. 7346 of his Catalogue under the name *Calanthe plantaginea*.

PLATE 141.—*Tainia minor*, Hook. fil. A plant; *of natural size*. Fig. 1 sepals and petals separated, 2 part of rachis, bract, stalked ovary, column and lip seen from the side, 3 lip, 4 column and anther, 5 anther, 6 pollinia; *all enlarged*.

2. TAINIA LATIFOLIA, Benth. ex Hook. fil. Fl. Br. Ind. V, 820.

Rhizome stout, with woolly roots. *Pseudo-bulbs* narrowly fusiform, about 1 in. apart, often enveloped in membranous sheaths, oblique, 3 to 4 in. long, not more than ·5 to ·75 in. thick. *Leaf* plicate, elliptic, acute, petiolate; length 9 to 12 in., breadth 2·25 to 4 in.; petiole 3·5 to 5 in., channelled. *Scape* 18 to 36 in. long, bearing several long tubular sheaths in the lower part and at the apex a lax many-flowered *raceme* 6 to 9 in. long. *Flowers* ·6 or ·7 in. long; *floral bract* small, linear-lanceolate, much shorter than the stalked ovary. *Sepals* and *petals* sub-equal, erecto-patent or spreading, linear-oblong, acute. *Lip* narrowly oblong-panduriform, 3-lobed, not spurred; the lateral lobes small, tooth-like, divergent; the terminal lobe large, bluntly triangular, the upper surface with a narrow central and two broad lateral lamellæ running from the base nearly to the apex. *Mentum* very short, blunt. *Column* narrow, curved, with a very short foot. *Anther* short, broad, with two crimson bosses. *Pollinia* in fours, broad, unequal, compressed, each united to a granular membrane. Hook. fil. Fl. Br. Ind. V, 820. *Tainia hastata*, Hook. fil. Ic. Plant., 2094. *Ania latifolia*, Lindl. in Wall Cat., 3741; Gen. and Spec. Orch., 130. *Eria Ania*, Reichb. fil. in Walp. Ann. VI, 270. *T. cordifolia*, Hook. fil. Fl. Br. Ind. VI, 193; in Ann. Bot. Gard. Calc., V, 24, t. 36.

Sikkim, in tropical valleys, ascending to elevations of 2,500 feet; many collectors, Pantling No. 106. Sylhet, Cachar and Khasia Hills; Wallich and others. Burma; Griffith.

The sepals and petals, the pedicels of the ovaries and the rachis of the inflorescence are of a uniform dark brown, the lip and column are yellow, and the pseudo-bulbs olive green.

PLATE 142.—*Tainia latifolia*, Benth. Leaf, pseudo-bulb and scape with its raceme; *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with the anther *in situ* and lip, *side view*, 3 lip, 4 column and anther, *front view*, 5 anther, 6 and 7 pollinia; *all enlarged*.

3. TAINIA HOOKERIANA, King and Pantling in Journ. As. Soc., Bengal, LXIV, pt. II, 336.

Pseudo-bulbs ovoid, tapering upwards, 2 to 3 in. long, rising close together from a stout rhizome, and enveloped in a *bract* which sheaths also the petiole nearly to its apex. *Leaf* plicate, oblong-lanceolate, tapering much to each end, the blade 12 to 18 in. long and about 3 in. broad, its petiole somewhat shorter. *Raceme* about 10 in. long; its stalk about twice as long, glaucous, bearing two or three sheathing bracts near the

base. *Flower* about 1 in. long; the *bract* linear, about one-third of the length of the stalked ovary. *Sepals* and *petals* sub-equal, lanceolate, acuminate. *Lip* oblong, with a short, blunt, curved spur, rather large blunt incurved side lobes, and a dilated sub-reniform apex apiculate in the centre; upper surface of the middle of the lip with three ridges which, beginning at the base as lines, pass into converging lamellæ towards the apex; spur blunt, incurved, exceeding the sepals by ·12 in. *Column* narrowly winged from base to apex. *Anther* with two purple bosses.

Sikkim, in tropical valleys, ascending to elevations of 2,500 feet, in flower in March; Pantling No. 204.

The colour of the sepals and petals is greenish with brown lines; the lip is white, and its lamellæ are yellow, spotted with pink. The anther is pink and its bosses are dark red. The species is near to *T. viridifusca*. We have dedicated it to Sir Joseph Hooker.

Plate 143. *Tainia Hookeriana*, King and Pantling. Pseudo-bulbs, flowering-scape and leaf. Fig. 1 sepals and petals separated, *of natural size*, 2 apex of ovary, column, anther and lip, seen from the side, 3 lip, 4 column and anther, 5 front of anther, 6 pollinia, 7 the same, side view; *all enlarged*.

14. Nephelaphyllum, Blume.

Terrestrial creeping herbs with succulent stems or pseudo-bulbs, and a few sub-coriaceous, petiolate, often coloured, ovate or cordate leaves. *Scapes* sheathed, flowers in racemes. *Sepals* free, narrow, spreading or recurved. *Petals* narrow. *Lip* sessile on the base of the column (attached to its foot in *N. grandiflorum*), usually shortly spurred. *Column* with winged edges. *Anther* 2-celled. *Pollinia* 8, unequal, adnate to a linear membrane. Species seven; Indian, Malayan and Chinese.

Column with a long foot, flowers with a mentum . . . . . 1. *N. grandiflorum*.

Column without a foot; flowers with no mentum, but with a short stout spur.

Lip broadly oblong, without lobes . . . . . 2. *N. pulchrum*, var. *Sikkimensis*.

Lip elongate-cuneate, 3-lobed . . . . . 3. *N. cordifolium*.

1. Nephelaphyllum grandiflorum, Hook. fil. Fl. Br. Ind. VI, 192; in Ann. Bot. Gard. Calc. V, pt. 1, 23, t. 34.

Pseudo-bulbs about 3 in. long, narrowly fusiform, touching by their bases, half covered by a membranous sheath and bearing at the apex a rather thick ovate-elliptic, acute, 7- to 9-nerved leaf, cordate at the base, 4 or 5 in. long, and 2·5 to 3 in. broad, the petiole undistinguishable from the pseudo-bulb. *Scape* with *raceme* much longer than the leaves, erect, slender; its peduncle with two sheaths 1 to 1·5 in. in length, one at the base and one about the middle; the *raceme* sparsely 6- to 10-flowered. *Flowers* 1 in. long; the *bract* linear-lanceolate, much shorter than the stalked ovary. Dorsal *sepal* lanceolate; the lateral pair larger, falcate and with broad bases. *Petals* as long as, but broader than, the dorsal sepal, acute, 5-nerved like the sepals. *Lip* sub-panduriform when flattened out; the side lobes large, rounded, erect; the terminal lobe triangular, acute, deflexed; the upper surface with a thickened mesial line and two lateral undulate lamellæ running from the base nearly to the apex. *Mentum* conical. *Column* and its foot

sub-equal. *Anther* dilated, compressed and 2-lobed at the apex, lateral margins of the clinandrium erose. *Pollinia* 8, unequal, one set of four much longer than the other set, all attached to a single membrane.

Sikkim, in the valley of the Teesta, at elevations of 1,000 to 1,500 feet; Pantling No. 206; in flower during March. Distrib. Perak.

The sepals and petals are of a pale greenish-brown colour, with dark brown nerves, the lip is white with small pink spots and a large blotch of pink at the apex. The lip has also a yellow blotch at the base, the mentum and column are yellow. The pseudo-bulbs and leaves are of a uniform green colour.

PLATE 144.—*Nephelaphyllum grandiflorum*, Hook. fil. A plant; *of natural size.* Fig. 1 sepals and petals separated from each other, 2 floral bract, stalked ovary, column with its foot, and the lip seen from the side, 3 lip, 4 upper part of the column with the anther *in situ*, 5 the same with the anther removed so as to show the erose edges of the clinandrium, 6 pollinia; *all enlarged.*

2. NEPHELAPHYLLUM PULCHRUM, Blume (Bijdr. 372, t. 32) var. *Sikkimensis*, Hook. fil., Fl. Br. Ind., V, 819.

Pseudo-bulbs 1 to 1·5 in. long, arranged in a chain, ovoid-cylindric, with large membranous sheaths when young, each bearing at the apex a broadly ovate-lanceolate, 5- or 6-nerved, rather thick blade deeply cordate at the base; length 3 to 4 in., breadth 1·75 to 2·5 in., petiole ·5 to 1 in. *Scape* from the base of the pseudo-bulb, sheathed, 3 or 4 in. long, bearing at its apex a few-flowered short *raceme*. *Flowers* ·65 to ·75 in. long; *floral bract* ovate-lanceolate, shorter than the shortly stalked ovary. *Sepals* and *petals* sub-equal, linear-oblong, acute, reflexed on the ovary. *Lip* almost flat, adpressed to the column, broadly oblong, without lobes, the apex broad and emarginate, the edges minutely crenulate; the upper surface with a broad thickened pubescent mesial band passing near the apex into 3 toothed ridges, the entrance to the bilobed spur at the base clothed with long hairs. *Column* without a foot, its sides narrowly winged from base to apex, the wings crenulate opposite the stigma. *Anther* short, broad and with two short horns. *Pollinia* 8, very unequal, the four smaller only one third of the size of the four larger.

Bhutan; Griffith (Kew Distrib. No. 5370); at Guru Bathan, elevation 1,500 feet; in flower during June; Pantling No. 216.

The pseudo-bulbs and under surfaces of the leaves are purple, while the upper surfaces have a metallic lustre and are green, flushed and mottled with purple; the sepals, petals, ovary and (in part also) the base of the lip are red, the anterior portion of the lip and its spur being yellow. The typical form of this is found in the Malayan countries. As described and figured by Blume (Orch. Archipel. Ind. 171, t. 61, p. 1), its pseudo-bulbs are quite cylindric, not having bulbous bases as in the variety *Sikkimensis*. The flowers are also paler in colour and slightly larger in size. The synonymy of the typical form is as follows:—*N. pulchrum*, Blume Bijdr. 372, t. 32; Orch. Archipel. Ind. 171, t. 61, p. 1; Lindl. Gen. and Spec. Orch. 24; Reichb. fil. Xen. Orchid. 1, 216, t. 88, p. 1; Bot. Mag. t. 5332.

PLATE 145.—*Nephelaphyllum pulchrum*, Blume, var. *Sikkimensis*, Hook. fil. A plant; *of natural size.* Fig. 1 a flower seen from the front, showing the reflexed sepals and petals and the lip partly hidden by the column, 2 lip, 3 bract, stalked ovary, winged column and saccate spur of lip, with the anther *in situ*, 4 anther, 5 pollinia; *all enlarged.*

3. Nephelaphyllum cordifolium, Blume Orchid. Archipel. Ind. 145, t. 61; Fig. 3, A to D (1858).

Stem succulent, brownish-purple, ascending from the creeping rhizome and producing at each joint a short pseudo-bulbous growth surmounted by a leaf, 8 to 12 in. high and bearing several membranous hyaline sheaths 1 to 3 in. long. *Leaves* thickly membranous, ovate-cordate, acute, boldly 5-nerved from the base, 2·5 to 4 in. long and 1·5 to 2 in. broad; the petiole dull purple, ·5 to 1 in. long, with a large sheath. *Raceme* 3- to 6-flowered. *Flowers* nodding, inverted, ·75 in. long; *floral bract* linear, about as long as the shortly stalked ovary, withered at flowering time. *Sepals* free, sub-equal, narrowly oblong, spreading or recurved, the lateral pair apiculate. *Petals* like the sepals but smaller, gibbous at the widest part. *Lip* parallel with and sessile on the base of the footless column, elongate-cuneate, 3-lobed, with a short knob-like 2-lobed spur at the base; the lateral lobes narrow, diverging, the edges erose; the terminal lobe broad, retuse, its upper snrface with 3 stout spine-like calli. *Column* long. *Anther* short, broad, with two short crimson horns. *Pollinia* unequal, cohering in fours by a granular substance. Lind. in Journ. Linn. Soc. III (1859); Hook. fil. Fl. Br. Ind. V, 818. *Citheris cordifolia*, Lindl. in Wall. Cat., 3750; Gen. and Spec. Orchid., 129.

Sikkim; at Labba, elevation 5,000 feet; Pantling No. 275; in flower during June. Khasia Hills; Wallich, Griffith (Kew Distrib. No. 5371), Hooker, Oldham, &c.

The flowers are green striped with purple, the lip and column being pale yellow. The leaves are green, suffused with pale and mottled with dull purple, they have also a broad streak of the same colour down the centre.

Plate 146.—*Nephelaphyllum cordifolium*, Blume. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, seen from the side, 3 section of the foregoing, 4 lip, 5 column with the horned anther *in situ*, and (at the base) the bilobed saccate spur of the lip, 6 anther, front view, 7 pollinia; *all enlarged*.

15. Phajus, Lour.

Terrestrial or epiphytal, with or without pseudo-bulbs, usually of large size. *Leaves* membranous, usually plicate. *Flowers* handsome, in a raceme from a scape rising from the base of the stem or pseudo-bulb, or from the axil of a leaf or at the apex of the stem. *Sepals* and *petals* sub-equal, erecto-patent, rarely spreading. *Lip* adnate to the base of the long footless column, erect, gibbous or spurred. *Anther* incompletely 4-celled. *Pollinia* 8, attached by fours to a granular membrane. Species about thirty, natives of the tropics of Asia and of the Pacific.

Flowering scape from the base of the stem or side of the pseudo-bulb.

Stem 2 or 3 in. long . . . . . *1. P. nanus.*

Stem 18 to 48 in. long.

Flowers yellow, sepals and petals erecto-patent, column hairy . *2. P. maculatus.*

Flowers buff and purple, or rarely yellowish; sepals and petals widely spreading, column glabrous.

Spur ·5 to ·75 in. long; anterior portion of lip ovate-rotund, dilated, acuminate . . . . . *3. P. Wallichii.*

Spur only ·25 in. long, anterior portion of lip contracted, triilobulate . . . . . 4. *P. Blumei.*
Raceme from the axil of a leaf half way up the stem, flowers rose-coloured . . . . . 5. *P. mishmensis.*
Raceme on the apex of the stem, flowers white . . . . . 6. *P. albus.*

1. Phajus nanus, Hook. fil. in Hook. Ic. Plant. t. 2088.

Rhizome stout, pseudo-bulbs none. *Stems* only an inch or two long. *Leaves* narrowly elliptic or oblong, lanceolate, acuminate, narrowed to the long petiole, the lower one often sheath-like; length 12 to 15 in., breadth 1·5 to 3 in.; petiole winged, 2 to 5 in. long. *Scape* from the base of the stem, erect, 6 to 9 in. long, bearing several wide scattered sheaths about 1 in. in length, and at its apex a 2- to 3-flowered *raceme*. *Flowers* 2·5 in. long; the *bract* large, lanceolate, cymbiform, about as long as the stalked ovary. *Sepals* and *petals* sub-equal, narrowly oblong, acuminate, spreading. *Lip* nearly orbicular when spread out, obscurely 3-lobed, the base with a slender spur only about ·25 in. long; the side lobes small, rounded; the middle lobe plicate, its terminal lobule broad and emarginate, its upper surface faintly nerved, puberulous. *Column* short, puberulous. *Anther* short, broad. *Pollinia* 8.

In the Western Duars of Bhutan, east of the Jaldacca river, at an elevation of 500 feet; Pantling No. 433; in flower in February.

A species at once recognised by its dwarf habit.

Plate 148.—*Phajus nanus*, Hook. fil. A plant; *of natural size.* Fig. 1 floral bract, ovary and lip with its spur, side view, 2 lip, 3 front view of the column showing the anther *in situ*, the spur, and the apex of the ovary, 4 lower surface of empty anther, 5 pollinia; *all enlarged.*

2. Phajus maculatus, Lindl. in Wall. Cat., 3748.

Pseudo-bulbs ovoid-cylindric, naked, 4 to 5 in. long, and 2 to 2·75 in. in diam. near the base. *Stem* 16 to 24 in. high. *Leaves* four to six, stoutly membranous, elliptic-lanceolate, acuminate, many-nerved, plicate, tapering to the petiole, 14 to 20 in. long and 3 to 4 in. broad, often spotted with yellowish-white. *Scape* from the base of the pseudo-bulb, 12 to 18 in. long, bearing several sub-tubular broadly lanceolate sheaths; the *raceme* many-flowered, rather crowded. *Flowers* 2·25 in. long; *bract* rather large, broadly lanceolate, longer than the shortly pedicelled ovary. *Sepals* sub-equal, oblong, obtuse, concave. *Petals* oblong-oblanceolate. *Lip* erect, oblong, concave, with a sharp spur at the base, side lobes narrow; terminal lobe deflexed, conchiform, its edges corrugated. *Column* without a foot, sparsely hairy in front. *Pollinia* 8, broad, compressed, attached in groups of four to two membranes. *Capsule* globose-ovoid, ribbed, 1·25 in. long. Lodd. Bot. Cab., t. 1803; Bot. Mag., t. 3960; Blume Mus. Bot. Lugd. Bat. II, 180; Orchid. Archip. Ind., 9; Hook. fil. Fl. Br. Ind. V, 817. *Bletia flava*, Wall. MSS. *B. Woodfordii*, Hook. in Bot. Mag., t. 2719; Reichb. fil. Fl. Exot., t. 63.

Sikkim, in tropical valleys; Hooker, Pantling No. 207; in flower during April. Nepal; Wallich. Khasia Hills; Griffith. Distrib., China, Japan.

In Sikkim the flowers are of a dull yellow with faint stripes of a darker shade, the terminal lobe of the lip being brown. Figure 3960 in the Botanical Magazine, however, shows the flowers as of a bright yellow, the sepals and petals tipped with green and

the lip blotched with red rather than with brown. In fig. 2719 of the same work, the prevailing colour of the sepals and petals is shown as green rather than red. Loddiges' figure shows the sepals and petals as of a pale primrose, the lip of bright yellow.

PLATE 149.—*Phajus maculatus*, Lindl. Pseudo-bulbs, leaf and part of scape; *of natural size*. Fig. 1 lip and ovary, 2 upper part of the column showing the stigma and the anther *in situ*, 3 empty anther seen from below, 4 pollinia, 5 side view of the pollinia; *all enlarged*, 6 capsule; *of natural size*.

3. PHAJUS WALLICHII, Lindl. in Wall. Pl. As. Rar. II, 46, t. 158.

Pseudo-bulbs conical, bearing three or four annular cicatrices and sometimes also one or two sheaths. *Stem* stout, 2 to 3·5 feet high, and from ·5 to ·75 in. thick. *Leaves* thickly membranous, elliptic-lanceolate, acute, tapering to the petiole, 12 to 24 in. long and 2·5 to 8 in. broad. *Scapes* from the side of the pseudo-bulb, 2 to 4 feet long, with several tubular sheaths 1·5 to 2 in. long; the *raceme* from 8 to 24 in., many-flowered. *Flowers* 4 to 6 in. across; *bract* large, cymbiform, slightly longer than the stalked ovary, caducous. *Sepals* and *petals* sub-equal, linear-lanceolate, acuminate, spreading. *Lip* shorter than the sepals and petals, its lower part tubular and ending in a narrow curved spur ·5 to ·75 in. in length; its anterior part deflexed, conchiform, more or less ovate, dilated, acute or acuminate, sometimes apiculate, the margins erose-undulate, the upper surface corrugated. *Column* erect, glabrous. *Pollinia* 8, dimidiately ovate, somewhat compressed, united by fours to two membranes. *Capsule* narrowly obovoid, stoutly ribbed, 3 in. long and 1·5 in. in diam. Lindl. Gen. and Spec. Orch. 126.; Lindl. in Bot. Reg. Misc., 44; Reichb. fil. in Walp. Ann. VI, 459; Paxt. Mag. Bot., t. 193; Bot. Mag., 7023; Hook. fil. Fl. Br. Ind. V, 816 (in part). *P. bicolor*, Lindl. Gen. and Spec. Orch. 128; Sertum Orch., t. 23; in Bot. Reg., 1839, Misc. 61; Bot. Mag., t. 4078. Wight Ic. t. 1659—60; Thwaites Enum. Pl. Ceyl., 300; Blume Mus. Bot. Ludg. Bat. II, 178; Walp. Ann. VI, 458. *P. grandifolius*, Lindl. in Wall. Cat., 3747 (*not of Loureiro*).

Sikkim, in tropical valleys and at the base of the range; many collectors; Pantling No. 120. Assam, Sylhet, Khasia Hills, Burma, Ceylon, also in the Malay Archipelago.

In Wallich's original figure of this species the sepals and petals are buff, and the lip is white tinged with yellow on the disc and externally, and also with slight touches of pink. The Sikkim plant here figured has darker sepals and petals, warm brown on the inner and white on the outer surface, while the lip is pale purple passing into white on the edges and into yellow in the tube.

PLATE 150.—*Phajus Wallichii*, Lindl. Pseudo-bulbs, part of a raceme and capsule, *of natural size*. Fig. 1 section through upper part of column, anther and spur, 2 empty anther, lower surface, 3 and 4 pollinia; *all enlarged*.

4. PHAJUS BLUMEI, Lindl. Gen. and Spec. Orch., 127, var. *pulchra*.

The characters of *P. Wallichii*, but the spur not exceeding ·25 in. in length, the mouth of the lip contracted and trilobulate, and the capsule ellipsoid and only 2·5 in. in length; inflorescence rather lax. Blume Orch. Archip. Ind. 2, t. 1; De Vriese Illustr. Orch. Archip. Ind., t. 8; Regel Garten-flora, XIV, t. 464. *P. Blumei*, var. *Berneysii*, Hook. fil. in Bot. Mag., t. 6032; var. *Assamica*, Reichb. fil. in Gard. Chron. for

1882, I, p. 558. *P. Wallichii*, Hook. fil. Fl. Br. Ind. V, 816 (*in part*). ? *Limodorum Tankervilliæ*, Roxb. Fl. Ind. III, 466 (not of Aiton).

Sikkim, in similar situations to *P. Wallichii;* in flower during March and April; Pantling No. 139. Kamroop and Luckimpur in Assam; Clarke, Mann, Watt. Khasia Hills; Gallatly. Burma; Griffith (Kew Distrib.), No. 5292.

There has been some confusion and uncertainty about the limits of the two closely allied species *P. Wallichii* and *P. Blumei*, much of which has doubtless arisen from reliance being placed on the colour of the flower as a means of separating the species. The tendency has been to refer individuals with pale-coloured flowers to *P. Blumei*, and those with dark-coloured flowers to *P. Wallichii*. Mr. Pantling has had for some time a number of plants of both, of local origin, in cultivation at the Government Cinchona Plantation, and the conduct of one of these during the present year has completely broken down our faith in colour as a means of separating the two. The plant referred to used to produce flowers with the long spur and dilated ovate-rotund acuminate lip which we have above given as characteristic of *P. Wallichii*. Hitherto the colouration of these has been as follows; sepals and petals warm brown on the inner surface, white or nearly so on the outer; lip with a pale purple mouth becoming paler towards the white margin, the tube being yellow. The shade of purple on the lip has in former years been observed to vary in intensity, and the palest coloured lips have usually been the widest; the very dark coloured lips being smaller in every way. This has hitherto been the limit of variation. But during the present year there appeared on the clump in question two racemes, the flowers on which had dull yellow sepals and petals and a pale yellow lip, the yellow shading into white at the margins. But these pale flowers had spur and lip of exactly the same shape as those on the other racemes which produced flowers of the normal colour. No change in structure accompanied the change in colour. We have on the strength of this experience, as well as from the examination of large suites of specimens, both living and dried, been driven to the conclusion that the form of the spur and lip are the only reliable characters to separate the two. Both species appear to have the same distribution. The Sikkim plant, which we have here figured as *P. Blumei*, has a more condensed raceme, larger flowers and smaller capsules than typical *P. Blumei*, and may be separated as a variety under the name *pulchra*. Two varieties of *P. Blumei* have been founded on the colour of their flowers. One from North Australia, which has been named variety *Berneysii*, has flowers of a sulphur yellow colour, the outer surface of sepals and petals being pure white; and closely allied to that is another described by Reichenbach *filius* (in Gardener's Chron. for 1882, I, p. 558), as *P. Blumei*, var. *Assamica*, which has "yellowish flowers with a light yellow lip bordered with white."

PLATE 151.—*Phajus Blumei*, Lindl. var. *pulchra*, King and Pantling. Pseudo-bulb, base of stem and raceme; *of natural size*. Fig. 1 lip, 2 lip seen from above, 3 column and spur, 4 empty anther, 5 pollinia, 6 side view of a group of four pollinia, 7 a fruit; *Nos. 1, 2 and 7 are of natural size, the others are enlarged.* An entire plant, *much reduced in size.*

5. PHAJUS MISHMENSIS, Reichb. fil. in Bonplandia V, 43.

Stems 3 to 4 feet high and ·5 to ·75 in. thick, swollen at the very base but hardly pseudo-bulbous, naked below or bearing at the nodes the fibres of decayed sheaths; above with six to eight stoutly membranous, many-nerved, plicate, elliptic-lanceolate, acute leaves, narrowed at the base to a sheathing petiole; length 7 to 12 in., breadth 3

to 4 in. *Raceme* axillary, few- and sparsely-flowered; its peduncle long, slender, decurved, bearing one or two lanceolate sheaths. *Flowers* (measured to the end of the spur) about 1·75 in. long; *bract* lanceolate, ·75 to 1 in. long, deciduous. *Sepals* sub-equal, narrowly oblong, sub-acute; the lateral pair sub-undulate, slightly broader than the dorsal. *Petals* narrowly spathulate, obtuse. *Lip* with a rather long sharp spur, when spread out sub-reniform, as long as the sepals, 3-lobed, puberulous, upper surface with a pubescent mesial ridge from base to apex; the lateral lobes large, broad, convolute into a tube, the apical lobe deflexed, sub-quadrate, emarginate both at the edges and at the broad apex; spur unequally and minutely bifid at the apex, pubescent internally. *Column* long, without a foot, the edges slightly winged towards the apex. *Anther* rounded, puberulous. *Pollinia* 8, narrowly oblong, slightly compressed, attached by fours to an elongated membrane. Reichb. fil. in Walp. Ann. VI, 922, 928; Hook. fil. Fl. Br. Ind. V, 817. *Limatodes mishmensis*, Lindl. and Paxt. Fl. Gard. III, 36.

Sikkim, at elevations of 4,000 to 6,000 feet, common; Pantling No. 18; in flower during September and October. Collected also by Clarke in Assam and in the Mishmi Hills by Griffith.

The flowers are rose-coloured, the petals being of rather a paler tint than the sepals, and the spur being a bright yellow. A form is occasionally met with having pure white flowers but, except that it is more slender in its habit, it differs from the type in no other respect.

PLATE 152—*Phajus mishmensis*, Reichb. fil. Leaf and raceme; *of natural size.* Fig. 1 floral bract, 2 sepals and petals, 3 side view of ovary, column and lip, 4 lip, 5 column with anther *in situ* and the spur of the lip, 6 anther, upper surface, 7 pollinia; *all enlarged.*

6. PHAJUS ALBUS, Lindl. in Wall. Cat., 3749; Pl. As. Rar. II, t. 198.

Pseudo-bulb none. *Stems* stout, erect, tufted, 1 to 3 feet long, bearing many tubular sheaths at the base and numerous leaves. *Leaves* membranous, glaucous beneath, distichous, narrowly elliptic-lanceolate or oblong-lanceolate, acuminate, sessile, 6 to 12 in. long and 1 to 2·25 in. broad. *Raceme* terminal, drooping, 4- to 6-flowered, 4 to 6 in. long, on a short peduncle with a single elongate sheath. *Flowers* 2 to 2·5 in. long and 4 in. wide when forcibly expanded; the *bract* nearly white, large, oblong, cymbiform, acute, equalling or exceeding the long-stalked ovary. *Sepals* free, sub-equal, narrowly oblong, acute; the *petals* slightly narrower, acute. *Lip* broadly oblong-pandurate when spread out, the base with a short slightly bifid horizontal spur; the lower half convolute into a tube; the anterior cucullate, forming a rounded shell-like mouth slightly acuminate and with sharply and unequally dentate undulate edges, the upper surface with seven to nine dentate crested ridges. *Column* slightly winged near the apex, with a very short foot. *Pollinia* 8, unequal, elongate. *Capsule* narrowly elliptic, 1·25 in. long. Lindl. Bot. Reg., 1838, t. 33; Paxt. Mag. V, t. 125; Bot. Mag., t. 3991. Grah. Cat. Bomb. Plants, 205; Blume Mus. Bot. Lugd. Bat. II, 181; Hook. fil. Fl. Br. Ind. V, 818. *P. Marshalliana*, Reichb. fil. in Linnæa XLI, 65; Regel Garten-flora, t. 1098. *Thunia alba*, Reichb. fil. in Bot. Zeit., 1852, 764. *T. pulchra*, Reichb. fil. in Gard. Chron., 1881, II, 166. *Limodorum bracteatum*, Roxb. Fl. Ind. III, 466.

Sikkim, at elevations of 2,000 to 4,000 feet; Pantling No. 81; in flower during May. Distributed westwards along the Himalayan chain to Gharwal. In the Khasia Hills, Burma and also on the Western Ghâts.

The sepals and petals are pure white; the lip is also white, or yellow with purple or orange veins, the crested laminæ being orange. In Burma is found a form (which has been named var. *Bensoniæ*) with rose-purple sepals and petals, and a deep purple lip white at the base. In Sikkim there is a form rather smaller in all its parts than the type, and with a shorter congested raceme, but not differing in form. This smaller form is epiphytal and does not ascend above an elevation of 3,000 feet. It is No. 171 of Mr. Pantling's gathering.

PLATE 153.—*Phajus albus*, Lindl. Part of a plant, *of natural size*; an entire plant; *much reduced in size*. Fig. 1 profile view of the stalked ovary, lip and spur, the column being hidden within the lip, 2 lip and spur from above, the latter flattened out, *of natural size*, 3 summit of the column, the anther *in situ*, 4 empty anther, 5 pollinia; *enlarged*.

16. Acanthephippium, Blume.

Terrestrial with large pseudo-bulbs bearing short stems and three to eight thickly membranous, plicate, petiolate leaves. *Flowers* few, large, fleshy, in a short lateral sheathed *raceme*. *Sepals* cohering, the lateral pair adnate to the long foot of the column to form a large pouched mentum. *Petals* erect, narrowed, included in the tube formed by the sepals. *Lip* mobile, small, stipitate, with broad incurved lateral lobes and a small triangular terminal lobe. *Column* short, stout, with a long foot. *Pollinia* 8, cohering by a granular mass. Species three or four, Indian or Malayan.

Pseudo-bulbs ovoid; flowers 1·5 to 1·75 in. long; petals narrowly rhomboid, spotted and protruding beyond the tube of the sepals disc of lip 4-lamellate . . . . . *1. A. sylhetense.*

Pseudo-bulbs elongate, obpyriform; flowers 1·25 in. long; petals, dimidiate, oblong, included, striped, disc of lip with a single central ridge . . . *2. A. striatum.*

1. ACANTHEPHIPPIUM SYLHETENSE, Lindl. Gen. and Spec. Orchid., 177.

Pseudo-bulbs large, ovoid, about 5 in. long and 2·5 in. in diam., tapering above into a stout leafy stem, the sides marked by the annular transverse cicatrices of two or three fallen leaves. *Stem* 4 to 12 in. high, about ·5 in. thick, bearing a sheath at the base and several leaves higher up. *Leaves* thickly membranous, plicate, many-nerved, elliptic, tapering to each end, acuminate, petiolate; length 12 to 15 in., breadth 2·75 to 4 in., petiole 2 or 3 in. *Scape* from the side of the base of the pseudo-bulb, 3 to 6 in. long, clothed with numerous broad acute imbricate sheaths and bearing a short few-flowered *raceme*. *Flowers* 1·5 to 1·75 in. long and ·8 in. across, fleshy; *floral bract* membranous, ovate, acute, concave, shorter than the long-stalked ovary. *Sepals* broadly oblong, cohering into a ventricose tube; the lateral pair adnate to the column to form a large saccate mentum, the tips of all free and recurved. *Petals* narrowly sub-rhomboid, sub-acute, included. *Lip* small, mobile, attached to the foot of the column, 3-lobed; the lateral lobes broad and boldly emarginate; the terminal lobe bluntly triangular, entire, recurved, its upper surface smooth, the disc between the lateral lobes with five narrow deep ridges. *Column* short, stout, with a foot longer than itself and bent at a right angle. *Anther* 2-celled, transversely oblong, its lip with a sharp point in the centre. *Pollinia* 8, oval, attached in fours to a granular mass. *Capsule* oblong, sub-clavate, boldly ribbed, glabrous, 2·5 in. long. Lindl. in Journ. Linn. Soc. III, 21; Hook. fil. Fl. Br. Ind. V, 815. *A. ringiflorum*, Griff. Notul. III, 347; Ic. Pl. Asiat., t. 325.

Sikkim, at elevations of 2,000 to 4,000 feet; Wallich Hooker *filius* and T. Thomson; Pantling No. 121; in flower during April and May. Khasia Hills; Hooker *filius*.

The flowers are of a dull white suffused and blotched with yellow; the apices of the sepals are purple and the upper halves of the petals are spotted with purple and yellow. The apex of the lip and the ridges on the disc are yellow. The ripe capsule is of a fine purple colour.

PLATE 154.—*Acanthephippium sylhetense*, Lindl. A plant; *of natural size*. Fig. 1 the petals, 2 part of ovary, column with its foot and the lip, seen from the side, 3 lip, 4 column and foot, anther *in situ* and base of lip, 5 empty anther, 6 pollinia; *all enlarged*.

2. ACANTHEPHIPPIUM STRIATUM, Lindl. in Bot. Reg. 1838, Misc., 45.

Pseudo-bulbs elongate-obpyriform, 3 or 4 in. long, and 1·5 in. in diam. at the base, clothed near the top with long brown fimbriate membranous sheaths and tapering into cylindric stems 4 or 5 in. long. *Leaves* elliptic, shortly acuminate or acute, tapering at the base into the short petiole; length 8 to 12 in., breadth 2·5 to 4·5 in. *Raceme* few-flowered, on a stout peduncle 3 or 4 in. long enveloped in long imbricate green sheaths often tipped and striped with red. *Flowers* 1·25 in. long and about ·65 in. in diam.; *floral bract* large, cymbiform, membranous, shorter than the stalked ovary. *Sepals* broadly oblong, cohering; the lateral pair broad, cohering to form an elongate conical mentum. *Petals* quite concealed by the sepals, dimidiate-oblong, their tips not protruding. *Lip* a little longer than the column, concealed by the sepals, oblong, with large lateral entire much incurved lobes and a small triangular terminal lobe with undulate edges; the upper surface without any calli or lamellæ, but with a single thickened ridge down the middle. *Column* short, with a long straight foot suddenly pouched and curved at the extremity. *Anther* 2-celled, its apex conical. *Pollinia* 8. Hook. fil. Fl. Br. Ind. V, 816; in Ann. Bot. Gard. Calc. V, pt. I, 22, t. 33; Reichb. fil. in Walp. Ann. VI, 460.

Sikkim, at elevations of 1,800 to 3,000 feet. Griffith (Kew Distrib. No. 5298); Pantling No. 269; in flower during July and August. Nepal. Khasia Hills; C. B. Clarke.

The flowers are pale pink with bold red lines, the mentum and lip being tinged with yellow.

PLATE 155.—*Acanthephippium striatum*, Lindl. A plant; *of natural size*. Fig. 1 the petals, 2 apex of ovary, column with its foot, anther *in situ* and lip, seen from the side, 3 lip, 4 column, foot, anther *in situ*, apex of mentum and base of lip, from the side, 5 empty anther, lower surface, 6 pollinia; *all enlarged*.

17. Arundina, Blume.

Terrestrial, with tall reed-like stems. *Leaves* numerous, membranous, distichous, narrow. *Flowers* large, rose-coloured, in erect terminal panicles or racemes. *Sepals* free, sub-equal, spreading. *Petals* broader and shorter. spreading. *Lip* large, cucullate, convolute at the base and embracing the column; the mouth large, 2-lobed at the apex. *Column* long, slender, narrowly winged, foot none. *Anther-cells* 4; *pollinia* 8, in two superposed unequal rows attached by fours to one membrane. Species eight or ten; Indian, Malayan and Chinese.

ARUNDINA BAMBUSIFOLIA, Lindl. in Wall. Cat. 3751; Gen. and Spec. Orch., 125.

Stem stout, woody, erect, reed-like, often about 1 in. in diameter at the base, 4 to 7 feet high. *Leaves* membranous, narrowly oblong-lanceolate, acuminate, not tapering at the sheathing base, 8 to 12 in. long, and ·75 to 1 in. broad. *Panicle* few-branched, lax, with broad acute stout keeled persistent *bracts*; the flowers few and at the terminations of the branchlets, 3 in. across vertically. *Sepals* free, spreading, sub-equal; the dorsal erect, oblong, acute; the lateral pair lying parallel behind the lip, lanceolate, 3-nerved. *Petals* rhomboid-elliptic, acute, spreading, shorter and broader than the sepals. *Lip* cucullate, its base convolute round the column; the mouth large, expanded, subquadrate, the basal lobes with recurved edges, the anterior corrugated; the apex broad and irregularly toothed, deeply bifid and with a very narrow sinus between the lobules, the disc with three lamellæ. *Column* long, slender, narrowly winged. *Anther-cells* 4: *Pollinia* 8, very unequal, in two rows, those of the upper row much longer than those of the lower, cohering in fours to one membrane. Lindl. in Bot. Reg. XXVII, Misc. 2; in Journ. Linn. Soc. III, 22; Wight Ic. 1661; Griff. Notul. III, 329, 331; Ic. Pl. Asiat., t. 314; Walp. Ann. VI, 457; Hook. fil. Fl. Br. Ind. V, 857. *Cymbidium bambusifolium*, Roxb. Hort. Beng., 63; Roxb. Fl. Ind. III, 460. *Bletia graminifolia*, Don Prodr. 29. *Limodorum graminifolium*, Ham. MSS.

Sikkim, from the base of the range to 3,000 feet, rather common; flowering from April to September. Pantling No. 17. Distributed westwards to Nepal and eastwards to Assam, the Khasia Hills, Manipur, Chittagong, and Upper Burma; also in the Nilgiri and Anamali Ranges in Southern India.

The sepals and petals are of a pale pinkish-purple; the lip of a most brilliant rosy-purple, which we have failed to imitate in our figure. The lamellæ of the disc are composed of two long lateral ones reaching to the sinus on the terminal lobe and having two crimson hooks at their bases, and of a short mesial one.

PLATE 156.—*Arundina bambusifolia* Lindl. Part of a panicle and of a leafy stem. Fig. 1 the base of the lip, the convolute sides having been cut away so as to show the lamellæ of the disc, 2 column with the anther *in situ*, 3 inner surface of anther, 4 pollinia; all *enlarged*.

18. Porpax, Lindl.

Small epiphytes with much depressed sub-discoid pseudo-bulbs clothed with reticulate sheaths. *Leaves* two, membranous, caducous. *Flowers* one to three, sub-sessile on the apex of the pseudo-bulb. *Sepals* connate into a tube; the lateral pair oblique at the base and adnate to the long-produced foot of the column. *Petals* small, free, included (except the tips in one species) in the sepaline tube. *Column* short, wingless, its foot longer than itself. *Pollinia* 8, unequal, attached by fours to a very short granular membrane. Distrib.; six species all Indian.

A small but very natural genus allied to *Eria*, but distinguished from that by its connate sepals which form a tube in which the petals are most entirely included; distinguished also by its small size and by its curious flattened reticulate pseudo-bulbs. It was founded by Lindley in 1845.

Edges of lip laciniate, anther tuberculate, flowers pubescent . . . . . *1. P. fibuliformis.*
Edges of lip entire, anther smooth, flowers glabrous . . . . . *2. P. Meirax.*

1. Porpax fibuliformis, King and Pantling.

Pseudo-bulbs crowded and often overlapping, much depressed, reticulate, ·5 in. in diam. *Leaves* membranous, in pairs, oblanceolate, sub-acute, sessile, the edges minutely ciliolate, 1·25 to 1 75 in. long. *Flowers* in pairs, ·25 in. long; their ovaries short, sigmoid. *Sepals* united to form a 2-lipped beaked sac, gibbous at the base. *Petals* oblong-lanceolate, sub-acute, falcate, not quite so long as the calyx, their apices connivent above the very small lip (1-nerved?). *Lip* half as long as the petals, oblong, clawed at the base, its upper surface concave, the side lobes broad and rounded, the part beyond them contracted and with laciniate edges, the apex carunculate, a small retrose callus in front of the basal claw. The foot twice as long as the column, tapering downwards. *Rostellum* large. *Anther* crested and tuberculate, its lip erose. *Pollinia* barely cohering by their minute membranes. *Eria fibuliformis*, King and Pantling in Jour. Asiat. Soc. Beng., Vol. XLIV, pt. 2, page 336.

Sikkim, in tropical valleys at the base of the hills, at Sivoke, &c.; in flower in October; Pantling, No. 278.

This resembles *Eria Lichenora*, Lindl. and *E. ustulata*, Par. & Reichb. fil. Its sepals are, however, united to form a curious 2-lipped sac sparsely hispid externally. All parts of the flower are of a uniform dull red colour.

Plate 157.—*Porpax fibuliformis*, King and Pantling. A plant; *of natural size*. Fig. 1 flower, 2 the petals, 3 floral bract, ovary, column and its foot, anther *in situ* and lip seen from the side, 4 lip, 5 column and its foot and anther *in situ*, rostellum and stigma, 6 pollinia; *all enlarged*.

2. Porpax Meirax, King and Pantling.

Pseudo-bulbs clustered, depressed-turbinate, almost discoid, ·35 in. in diam., leafless at flowering time, covered by a set of thin fibres which radiate from the centre (apex) and are connected by a membrane, not reticulated when fresh but minutely so when dry. *Leaves* two, elliptic-oblong, mucronate, 1 in. in length, shortly petiolate. *Flower* about ·5 in. long, solitary, from the centre of a pseudo-bulb; *floral bract* large, erect, concave, acuminate, twice as long as the shortly-stalked ovary. *Sepals* connate into a 3-toothed bilabiate tube ·3 in. long; the teeth ovate, shortly awned, the upper one re-curved. *Petals* shorter than the sepaline tube, oblong-lanceolate, blunt. *Lip* ovate-orbicular at the base, the apex obtusely acuminate, the base with a triangular notch; the side lobes rounded, their edges upturned; the terminal lobe oblong, tapering to the blunt apex, the margins entire. *Column* short, its foot twice as long as the column, curved, convex in front. *Rostellum* large, quadrate, overlapping the upper part of the stigma. *Pollinia* 8, unequal, broadly clavate, their bases granular and slightly cohering in groups of four to a small membrane. *Eria Meirax*, N. E. Brown in Gard. Chron., 1880, I, 603; Hook. fil. Fl. Br. Ind. V, 186. *E. Elwesii*, Reichb. fil. in Gard. Chron, 1883, I, 402. *Cryptochilus Meirax*, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 148.

Sikkim, at elevations of from 1,500 to 2,500 feet; Elwes, Pantling, No. 249; in flower during October? Tenasserim, near Moulmein, Parish.

The colour of the flowers is dull brown throughout.

In the Burmese specimens, described under the name of *Cryptochilus Meirax* by Parish and Reichenbach *filius*, the edges of the petals are ciliolate and their surfaces slightly hairy, while the edges of the lip are serrulate. In the Sikkim plant the petals are glabrous and the lip is entire. The flowers of the Burmese plant also appear

to be slightly larger. In other respects the two are alike. The minuter reticulations on the hyaline membrane which covers the pseudo-bulbs are not visible while the plant is fresh; they become so only after the pseudo-bulbs have become dry. There are, however, sometimes a few radiating and some reticulate nerves which are visible even on fresh pseudo-bulbs.

PLATE 158.—*Porpax Meirax*, King and Pantling. Plants in flower and in leaf; *of natural size*. Fig. 1 a single plant, showing the discoid pseudo-bulb, large floral bract and the flower, 2 part of ovary, column with its foot, anther *in situ* and lip, seen from the side, 3 the petals, 4 the lip, 5 column with its foot and the anther *in situ*, 6 under surface of anther, 7 pollinia; *all enlarged*.

19. Eria, Lindl.

Epiphytal; usually pseudo-bulbous, the pseudo-bulbs often elongated and stem-like. *Flowers* never large, rarely brightly coloured, often pubescent or tomentose, in racemes spikes or heads, or on 1- to 2-flowered pedicels. *Sepals* free, adnate to the elongate foot of the column and with it forming a short or long and spur-like or saccate mentum. *Lip* sessile on the foot of the column and incumbent. *Column* short and straight, or long and little curved. *Anther* imperfectly 4- or 8-celled. *Pollinia* 8, pyriform or broadly obovoid, attached in fours by their bases to a granular membrane, or the whole occasionally attached to a single viscus.

A polymorphous genus comprising about 160 species, all tropical Asiatic. It is separated from *Dendrobium* really by the single character of having 8 pollinia instead of 4. We have maintained most of the sections adopted by Sir Joseph Hooker in his Flora of British India, but we have not arranged them in the same sequence. Sir Joseph's section *Porpax* we have restored to generic rank; and for *Eria discolor* we have restored, as suggested by Sir Joseph himself, the Blumean genus *Tylostylis*. We have reduced the genus *Trichosma*, Lindl. to *Eria*, as had at one time been suggested by Lindley himself

**Ovary and its pedicel not winged; peduncle not equitantly bracteate.*

Flowers glabrous or pubescent; never woolly—

I.—*Bryobium*. Small plants with depressed-globular pseudo-bulbs bearing two to four membranous leaves. Raceme from between the leaves, with small glabrous flowers . . . . . 1. *E. muscicola*.

II.—*Hymeneria*. Plants with short or long pseudo-bulbs having one or several nodes, or with a leafy stem. Flowers usually about ·5 to ·75 in. long (some smaller), glabrous or pubescent, never woolly or tomentose, usually in racemes, rarely in heads or spikes.

Flowers ·2 in. long, in 1- to 2-flowered peduncles . . . . . 2. *E. biflora*.
Flowers ·25 in long, sub-globose, in dense many-flowered spikes . . 3. *E. convallarioides*.
Flowers minute, in dense heads ·35 to ·5 in. in diam . . . . . 4. *E. pumila*.

Flowers ·5 to ·75 in. long, in many-flowered racemes (1 in. across in *E fragrans* and only ·35 in. long in *E. excavata*.)

Stems 2 or 3 feet long with numerous leaves; flowers brown, streaked, externally rusty-pubescent . . . . . 5. *E. bambusifolia*.

Pseudo-bulbs with a single node, bearing leaves at the apex only.

Pseudo-bulbs narrowly cylindric, 4 to 6 in. long, flowers white with yellow lip. . . . . 6. *E. graminifolia*.

Pseudo-bulbs stoutly cylindric, tapering to the apex, 2 to 4 in. long.

Flowers green with brown stripes; raceme single, many-flowered, shorter than the leaves, much decurved; lip without side lobes . . . . . *7. E. vittata.*

Flowers pale yellow; racemes few-flowered, shorter than the leaves, spreading, not decurved; lip with large side lobes . *8. E. bractescens.*

Pseudo-bulbs ovoid-elliptic, 1·25 to 1·5 in. long; flowers pale greenish, usually closed, the lip alone streaked with brown . *9. E. clausa.*

Pseudo-bulbs ellipsoid, 2 to 3 in. long; raceme longer than the leaves; flowers white, the apex of the column and side lobes of the lip alone pink . . . . . *10. E. fragrans.*

Pseudo-bulbs with more than one node, bearing sheaths or leaves along their sides.

Pseudo-bulbs clavate, furrowed, 4 to 5 in. long, bearing several pubescent racemes on their sides; flowers pubescent, the ovaries long-stalked . . . . . *11. E. confusa.*

Pseudo-bulbs narrowly ellipsoid, 1·5 to 2·5 in. long, much compressed vertically, furrowed and with several transverse cicatrices of fallen leaves; racemes from the axils of leaves, few-flowered, glabrous; sepals and petals spreading . . . *12. E. acervata.*

Pseudo-bulbs oblong, tapered to each end, curved, shrunken, about 1·5 in. long; racemes solitary, the rachis pubescent; sepals and petals not spreading . . . . . *13. E. excavata.*

III.—*Trichosma.* Pseudo-bulb long (5 or 6 in.), thin, cylindric, bearing at its apex two membranous sessile leaves. Raceme terminal, bearing a few large white flowers . . . . . *14. E. coronaria.*

Flowers woolly externally—

IV.—*Mycaranthes.* Pseudo-bulbs elongate-cylindric, naked, bearing two narrow terminal leaves. Flowers small, woolly, in a long secund spike, lip with a smooth callus . . . . . *15. E. stricta.*

V.—*Eriura.* Stem elongate, terete, bearing many long narrow leaves. Flowers small, woolly, in sub-terminal spikes or racemes, not secund; lip with two large granular calli . . . . . *16. E. paniculata.*

VI.—*Dendrolirium.* Pseudo-bulbs short, bearing several flat or terete terminal or sub-terminal leaves. Flowers tomentose externally; raceme on a tomentose rachis; sepals broadly triangular, spreading.

Leaves flat; pseudo-bulbs large, much compressed, 3 to 4 in. long . *17. E. flava.*

Leaves terete; pseudo-bulbs none . . . . . *18. E. pannea.*

VII.—*Trichotosia.* Stems long, pubescent-tomentose like the leaves and exterior of the sepals, leaves numerous; flowers solitary or in short leaf-opposed racemes; the lip without lateral lobes or with very narrow ones.

Flowers solitary, stems procumbent . . . . . *19. E. dasyphylla.*

Flowers in very short racemes, stems pendulous . . . . . *20. E. rufinula.*

***Ovary and its pedicel winged; peduncle equitantly sheathed.*

VIII.—*Xiphosium.* Pseudo-bulb 1-leaved; peduncle of the solitary raceme enveloped in the conduplicate young leaf sheathed by numerous large equitant bracts. *Flowers* large (1 in. long); sepals keeled and (like the petals) polished, ovary and pedicel 3-winged . . . *21. E. carinata.*

1. ERIA MUSCICOLA, Lindl. in Journ. Linn. Soc. III, 47.

Height of the whole plant not exceeding two inches. *Pseudo-bulbs* coespitose, depressed-globular, reticulate, ·25 in. broad. *Stem* short, slender. *Leaves* two to four, oblanceolate, apiculate, sessile, ·5 to 1·25 in. long and about ·25 in. broad. *Scape* terminal, slightly longer than the leaves, erect; the peduncle with one or two *bracts*; the *raceme* 3- to 6-flowered, secund. *Flowers* ·25 in. across, pale green; *floral bract* lanceolate, acuminate, longer than the curved sessile ovary. *Sepals* sub-equal, lanceolate, acuminate, spreading; the lateral pair falcate. *Petals* narrower than the petals, spreading. *Lip* shorter than the sepals, lanceolate, concave, slight dilated and deflexed at the middle, without side lobes, erose towards the minutely tri-lobulate apex, the disc with two calli at the very base. *Column* short with a long curved foot. *Lip* of the anther emarginate. *Pollinia* oblong, laterally compressed. Hook. fil. Fl. Br. Ind. V, 789. *Dendrobium muscicola*, Lindl. in Wall. Cat., 2017; Gen. and Spec. Orchid., 75.

Sikkim, at Namtse, elevation 4,000 to 5,000 feet, Pantling, No. 163; in flower during August. Nepal; Wallich. Khasia, altitude 3,000 to 4,000 feet; Griffith. Tenasserim; Parish.

This species is said also to occur in Ceylon, and Thwaites' C. P. No. 2355 is referred to it; but an examination of the Ceylon plant shows its lip to be without calli at the base, and its ulterior margins to be entire, not serrate. The Sikkim plant is closely allied to *E. Dalzelli*.

PLATE 159.—*Eria muscicola*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, sessile ovary, the column and its foot, the anther *in situ* and the lip seen from the side, 3 lip, 4 column and foot with anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

2. ERIA BIFLORA, Griff. Notul. III, 302 (*not of Lindl.*)

Pseudo-bulbs tufted, stem-like, clavate, compressed, 2·5 to 4 in. long, bearing the remains of several scattered sheaths. *Leaves* three to five, narrowly elliptic, acute, slightly narrowed to the base, 2 to 2·5 in. long and ·5 to ·65 in. broad. Peduncles ·25 to ·35 in. long, 1- or 2-flowered. *Flowers* ·2 in. long, glabrous; *floral bract* large, petaloid, as long as the flower, elliptic, recurved, ovary shortly stalked. *Sepals* connivent, the dorsal narrowly elliptic; the lateral pair with broad bases, falcate. *Petals* nearly as long as the dorsal sepal, oblong, obtuse. *Lip* oblong, with very narrow incurved side lobes; the apex blunt, emarginate, with papillose margins and a central oblong callus, the disc with two bold erect parallel laminæ from the base to near the apex. *Mentum* triangular. *Anther* with an orbicular fleshy top and membranous edges. *Pollinia* obovate, cohering by a delicate granular membrane. Hook. fil. Fl. Br. Ind. V, 800. *Trichotosia biflora*, Griff. Notul. III, 331; Ic. Pl. Asiat., t. 315.

Sikkim, in tropical valleys, Pantling, No. 244; in flower during September? Tenasserim, at Mergui; Griffith.

The flowers are of a nearly uniform pale yellow, the large floral bract being of a deeper shade of the same colour.

PLATE 160.—*Eria biflora*, Griff. A plant; *of natural size*. Fig. 1 floral bract, stalked ovary and flower, side view, 2 ovary, column with its foot, anther *in situ* and lip, side view, 3 lip, 4 front view of column, foot and anther, 5 anther seen from above, 6 pollinia; *all enlarged*.

3. Eria convallarioides, Lindl. in Wall. Cat., 1975.

Pseudo-bulbs tufted, flattened, 3 to 7 in. long, covered when young with large loose sheathing bracts ·75 to 1·25 in. wide. *Leaves* four to six, elliptic-lanceolate or oblanceolate, acute, subcoriaceous, many-nerved but not plicate, 4 to 7 in. long, and 1·25 to 1·6 in. broad. *Spikes* cylindric, produced on the young growths and proceeding from the axils of the bracts and leaves, decurved; their peduncles short, naked. *Flowers* sub-globose, about ·25 in. in diam., numerous, densely crowded; *floral bract* ovate-lanceolate, concave, equalling the sessile pubescent ovary, the *bracts* at the base of the spike largest. *Sepals* broadly ovate, obtuse, the lateral pair very concave. *Petals* oblanceolate-oblong, spreading, nearly as long as the sepals but much narrower. *Lip* cuneate, obscurely 3-lobed, concave, the apex sub-acute, the disc without lamellæ. *Column* rather slender, with a long much-curved foot. *Pollinia* clavate, attached to a large translucent sub-globular viscus. *Capsule* oblong, obtuse, not winged. Lindl. Gen. and Spec. Orchid., 70; in Bot. Reg., 1841, t. 62, Misc. 58; in Journ. Linn. Soc. III, 53; Reichb. fil. in Walp. Ann. VI, 276; Hook. fil. Fl. Br. Ind. V, 791. *Octomeria spicata*, Don Prod. 31. *O. convallarioides*, Wall. MSS. *Pinalia alba*, Herb. Ham.

Sikkim, at elevations of 2,000 to 6,000 feet, common, Pantling, No. 41; in flower during July and August. Gharwal, Kumaon, Nepal, Khasia and Naga Hills, also in Tenasserim.

The flowers are white or of a pale straw-colour, the column being tinged with red and the lip with yellow. They are quite inodorous. Specimens grown at low elevations have often more slender pseudo-bulbs and narrower leaves than those from cooler places, the spikes also are longer and not so densely flowered.

Plate 161.—*Eria convallarioides*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 ovary, column with its foot, anther *in situ* and lip, 3 lip, 4 column showing the pollinia from which the anther has been drawn back, 5 anther from below, 6 pollinia; *all enlarged*.

4. Eria pumila, Lindl. in Wall. Cat., 1972; Gen. and Spec. Orchid., 68.

Rhizome stout, densely covered with fibrous sheaths. *Pseudo-bulbs* rather crowded, sub-cylindric or slightly clavate, compressed, 3 to 4 in. long and about ·5 in. thick when fresh. *Leaves* three or four, linear-lanceolate, tapering to each end, 2·5 to 3·5 in. long and ·3 to ·5 in. broad. *Flowers* minute, in dense capitula ·35 to ·5 in. in diam. and borne on short axillary peduncles; *floral bract* oblong, sub-acute, glabrous, as long as the tomentose ovary. *Sepals* broadly oblong, obtuse. *Petals* much narrower, but of the same length, blunt, spreading. *Lip* broadly oblong, 3-lobed, with two calli near the base which are produced into faint ridges on the disc; the lateral lobes short, tooth-like, acute, erect; the anterior lobe broad, hispid-pubescent, deeply bilobulate at the apex, the lobules separated by a wide sinus. *Column* rather long, the foot short, flat, pubescent. *Pollinia* stoutly clavate, attached to a small depressed-globular viscus. *Stigma* with 2 minute processes on its lower margin. Lindl. in Bot. Reg., 1838, Misc. 79; Walp. Ann. VI, 278; Hook. fil. Fl. Br. Ind. V, 791.

Sikkim, in tropical valleys, in flower during August? Pantling, No. 291; Khasia Hills; Wallich. Tenasserim, near Moulmein; Parish.

The flowers are white flushed with pink, the upper part of the column and the lateral lobes of the lip being red.

PLATE 162.—*Eria pumila*, Lindl. A plant; *of natural size*. Fig. 1 flower, 2 floral bract, column and its foot, anther *in situ* and lip, 3 lip, 4 column, the pollinia *in situ* being shown by the dehiscence of the anther, 5 anther, 6 pollinia; *all enlarged*.

5. ERIA BAMBUSIFOLIA, Lindl. in Journ. Linn. Soc. III, 61.

Stem 2 to 3 feet long and about ·35 in. thick, enveloped in large blunt tubular sheaths. *Leaves* numerous, thickly membranous, many-nerved, narrowly elliptic-oblong, acuminate, tapering slightly to the base, 4 to 8 in. long and 1 to 1·75 in. broad. *Racemes* about as long as the leaves, few-flowered, the rachises rusty-pubescent; the peduncles with scattered broad short broadly ovoid pubescent bracts. *Flowers* ·5 or ·6 in. long, distant; *floral bract* broad, sub-orbicular, apiculate, much shorter than the long-stalked rusty-pubescent ovary. *Sepals* rusty-pubescent externally, 5-nerved, spreading; the dorsal broadly elliptic, blunt; the lateral pair similar but falcate. *Petals* narrower than the sepals, elliptic-oblong, 3-nerved, blunt, spreading. *Lip* ovate-oblong, deflexed from below the middle, obtuse, with small side lobes; the upper surface with three bold pubescent ridges from base to apex and two short additional ones near the apex. *Mentum* short. *Column* long, curved; the foot straight, shorter than the column. *Pollinia* obovoid-elliptic, compressed, attached to a short granular membrane. *Capsules* cylindric, slender, 1 to 1·5 in. long. Hook. fil. Fl. Br. Ind. V, 805.

Sikkim, at Rissisoom, altitude 6,000 feet; in flower from October to December; Pantling, No. 355. Khasia Hills; Griffith (Kew Distrib. 5112), Simons, Mann. On Mohendragiri, in the Ganjam Hill Tracts, altitude 4,500 feet; Gamble.

The flowers are pale brown with darker lines; the three ridges on the lip being pale green and the column yellow behind and pink in front. The unexpected discovery of specimens of this on the hill ranges of the eastern coast of Peninsular India, shows that it must not as heretofore be regarded as a species peculiar to the Eastern Himalaya and Khasia Hills, and is an illustration of the scantiness of our knowledge of the minuter details of the distribution of Indian Orchids. *E. crassicaulis*, Hook. fil., from the Khasia range, is a close ally of this, but the flowers have a different lip.

PLATE 163.—*Eria bambusifolia*, Lindl. A plant; *of natural size*. Fig. 1 a flower, front view, 2 floral bract, stalked ovary, column, foot, anther and lip, side view, 3 lip, 4 front view of column and its foot with the anther dehisciug, 5 under surface of anther, 6 pollinia; *all enlarged*.

6. ERIA GRAMINIFOLIA, Lindl. in Journ. Linn. Soc. III, 54.

Pseudo-bulbs narrowly cylindric, 4 to 6 in. long, coherent and rooting below, and bearing when young several long tubular sheaths. *Leaves* two to six, thickly membranous, many-nerved, linear-lanceolate, acuminate, narrowed towards the base; length 4 to 6 in., breadth ·35 to ·75 in. *Racemes* solitary or several produced from among the young leaves, somewhat shorter than the leaves, erect, the rachis glandular-pubescent, the peduncle short. *Flowers* 15 to 20, about ·5 in. across; *floral bract* ovate, acuminate, shorter than the glandular-pubescent ovary. *Sepals* spreading, elliptic-lanceolate, the lateral pair broader than the dorsal, sub-falcate. *Petals* oblong, sub-acute, sub-falcate, about as long as the sepals. *Lip* fleshy, shorter than the petals, broadly oblong in general outline, 3-lobed, the side lobes oblong, blunt, erect, incurved; the terminal lobe transversely oblong, its apex emarginate and with a large oblong callus in the middle; the disc with three parallel stout ridges, the middle one of which ends in the apical callus and the side ones in two smaller calli.

Column with a short broad puberulous foot. *Pollinia* clavate, united in two sets to a small globose viscus. Hook. fil. Ic. Plantar., t. 1847; Fl. Br. Ind. V, 794. *E. alba*, Lindl. in Journ. Linn. Soc. III, 53, var. b.

Sikkim, at elevations of 5,000 to 7,000 feet; Griffith (Kew Distrib. No. 5115), Gamble, Gammie and others, rather common; Pantling, No. 371; in flower during July and August.

The sepals and petals are pure white. The disc of the lip is also white, but its ridges and the anterior lobe are yellowish-white; the side lobes are red.

PLATE 164.—*Eria graminifolia*, Lindl. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, seen from the side, 3 lip, 4 column and its foot, the anther *in situ*, 5 lower surface of anther, 6 pollinia; *all enlarged*.

7. ERIA VITTATA, Lindl. in Journ. Linn. Soc. III, 51.

Rhizome stout; pseudo-bulbs about one inch apart, cylindric, tapering upward, 2 to 4 in. long and about ·5 to ·65 in. in diam. near the rhizome, bearing several large unequal sheathing *bracts* especially near the base. *Leaves* two, membranous, many-nerved, elliptic-lanceolate, acute, tapering to the base, 6 to 8 in. long and 1·5 to 2 in. broad. *Raceme* from the summit of the pseudo-bulb outside the leaves, decurved, many-flowered, about half as long as the leaves; its peduncle about 1 in. long, sheathed at the base. *Flowers* ·75 in. long; the *floral bract* reduced to a thickened ring. Dorsal *sepal* oblong, sub-acute; the lateral pair triangular-oblong, falcate, spreading, forming with the column a wide short mentum. *Petals* narrowly oblong, slightly falcate, obtuse. *Lip* oblong, without lobes, decurved and crenulate in its terminal third, the apex broad; the upper surface with five crenulate ridges from base to apex. *Column* slender, shorter than its purple foot. *Rostellum* elongate, cylindric, coloured red. *Pollinia* ovoid, attached in fours at their backs by a granular membrane. Reichb. fil. in Gard. Chron., 1882, I, 330; Hook. fil. Fl. Br. Ind. V, 794.

Sikkim, at elevations of 5,000 to 6,000 feet; in flower during March and April; Pantling, No. 62. Munipur; Watt, No. 7451.

The flowers, which are very fragrant, are pale green, the sepals and petals being striped and the lip as well as its lamellæ being spotted and striped with purplish-brown.

PLATE 165.—*Eria vittata*, Lindl. A plant; *of natural* size. Fig. 1 a flower, 2 the abortive floral bract, ovary, column and its foot, anther and lip, seen from the side, 3 lip, 4 column and foot showing the pollinia *in situ*, 5 clinandrium, rostellum and stigma, 6 anther, 7 pollinia; *all enlarged*.

8. ERIA BRACTESCENS, Lindl. in Bot. Reg. 1841, Misc. 18, 1844, t. 49.

Pseudo-bulbs narrowly cylindric, tapering towards the apex, slightly curved, somewhat wrinkled at flowering time, 2 to 4 in. long and ·7 in. in diam. *Leaves* three to six (rarely only two), sub-coriaceous, elliptic-oblong, sub-acute, tapering to the base, 5 or 6 in. long and 1·25 to 1·75 in. broad. *Racemes* several, axillary, lax, their peduncles sheathed at the base. *Flowers* ·6 in. long and ·75 in. across, quite glabrous; *floral bract* elliptic-ovate, reflexed, the margins sometimes involute, shorter than the long-stalked ovary. *Sepals* spreading, sub-acute; the dorsal narrowly elliptic, the lateral pair broader. *Petals* narrowly oblong, shorter than the sepals, their apices blunt and revolute. *Lip* oblong, expanded towards the apex, 3-lobed; the lateral lobes erect, large, rounded; the terminal lobe entire, blunt, deflexed at the apex; the upper surface with three lamellæ running

along nearly its entire length, the two lateral being dilated in the basal half and having glandular margins, the middle one minutely papillose in its basal half. *Column* stout, its foot short. *Anther* with a truncate incurved lip. *Pollinia* in fours, compressed, attached by their backs to a granular membrane. Reichb. fil. in Walp. Ann. VI, 277; Hook. fil. Fl. Br. Ind. V, 796.

Sikkim, at elevations of from 1,000 to 3,000 feet; flowering in April; Pantling, No. 137. Chittagong; Lister. Tenasserim; Parish. Singapore; Lobb.

The flowers are of a uniform pale yellow colour, the lamellæ on the lip being red. They are short-lived, not surviving more than two days. The species is allied to *E. confusa*, Hook. fil., but differs in being quite glabrous and in having pseudo-bulbs without nodes. It has not hitherto been recorded from Sikkim; but there are in the Calcutta Herbarium two drawings made by the late Dr. Simons from specimens collected by him in Assam. There is also a specimen obtained by Mr. J. L. Lister near Chittagong. The larger form of this, which has been separated as var. *Kurzii*, extends through Burma to the Andaman and Nicobar Islands.

PLATE 166.—*Eria bractescens*, Lindl. A plant; *of natural size*. Fig. 1 a flower, front view, 2 floral bract, stalked ovary and flower, side view, 3 part of ovary, column and lip, side view, 4 lip showing the lamellæ, 5 transverse section of the basal half of the lip, showing the glandulose lamellæ, 6 front of column showing the anther *in situ* and the stigma, 7 lower surface of anther, 8 pollinia; *all enlarged*.

9. ERIA CLAUSA, King and Pantling in Journ. As. Soc. Vol. LXV, pt. 2, p. 121.

Rhizome ·15 in. thick, jointed, smooth, with a few short membranous sheaths. *Pseudo-bulbs* 1·5 to 2 in. apart, 1·25 to 1·5 long and ·75 in. in diam., ovoid-ellipsoid, blunt at the apex, the bases clothed with the fibrous remains of sheaths. *Leaves* two or three, membranous, narrowly lanceolate, tapering to each end, sessile, 4 to 6 in. long and ·8 to 1 in. broad. *Scapes* rather shorter than the leaves, one or two from the summit of the pseudo-bulb, each enveloped for more than half its length by a narrow convolute sheath; *raceme* stout, erect; *floral bract* nearly obsolete, and represented by a slightly thickened ring at the base of the stalked ovary. *Flowers* from 15 to 20, about ·3 in. long, slightly shorter than the ovaries, the buds often not expanding. *Sepals* and *petals* oblong, blunt. *Lip* oblong, with two rounded oblique lateral lobes near the apex, the short caruncled rounded mid lobe with five to seven vertical lines, the edges entire, the disc between the side lobes with three parallel raised slightly sinuous vertical lines. *Column* long, rostellum flattened against the back of the clinandrium. *Stigma* small, with two sub-globular convexities inside its lower margin.

Sikkim, not uncommon at elevations of 3,000 to 5,000 feet; flowering during February and March; Pantling, No. 359.

This species in many respects resembles *E. vittata*, Lindl. (of which it may possibly be a cleistogamic form), but is a much smaller plant, with smaller pseudo-bulbs and a shorter and erect raceme. The flowers of both are similar in form, with the exception that the lip of this has lateral lobes, while in *E. vittata* the lip is entire; and that the disc of this has three elevated vertical lines on its surface, whereas the lip in *E. vittata* has five crenulate wavy ridges. The colour of the flowers of the two also differs, those of this species being pale greenish with brown streaks on the lip only; whereas the flowers of *E. vittata* are green with prominent brown streaks on all their parts. The

time of flowering of the two species is the same, and they are found in similar situations. In many cases the flowers of this do not open; nevertheless the ovaries set seeds, and capsules form and ripen, self-fertilization being effected by the rostellum disappearing from its normal position and being pressed against the back of the clinandrium, thus permitting the pollinia to come into direct contact with the stigma.

PLATE 167.—*Eria clausa*, King and Pantling. A plant; of *natural size*. Fig. 1 stalked ovary and fully developed flower-bud, 2 part of ovary, column with its foot, and the lip, seen from the side, 3 lip, 4 summit of column taken from a mature but unopened bud showing the anther and stigma, 5 the same with the anther removed, showing the rostellum (*r*) flattened against the back of the clinandrium, 6 the same as No. 4 but from an older bud, showing the pollinia in process of absorption by the stigma; *all enlarged*.

10. ERIA FRAGRANS, Reichb. fil. in Bot. Zeit. XXII, 415.

Rhizome woody, covered with sheaths; pseudo-bulbs about an inch apart, 2 to 3 in. long, ellipsoid, bearing several large membranous sheaths. *Leaves* in pairs, thickly membranous, many-nerved, elliptic-oblong, the apex acuminate, tapering at the base into a short petiole; length 8 to 12 in., breadth 1·25 to 1·75 in. *Raceme* longer than the leaves, decurved, rather lax, the rachis more or less pubescent, the peduncle with a few lanceolate *bracts*. *Flowers* numerous, about 1 in. across; *floral bract* lanceolate, pubescent, longer than the stalked pubescent ovary. *Sepals* sub-equal, lanceolate, acuminate, pubescent externally, spreading, their apices reflexed. *Petals* like the sepals but smaller, falcate, glabrous, spreading but not reflexed. *Lip* narrowly oblong, 3-lobed, deflexed about the middle; the lateral lobes short, broad, sub-falcate, obtuse; the terminal lobe narrowly oblong, acute, its upper surface with five crisped narrow ridges. *Column* short, rather broad, shorter than its curved foot. *Pollinia* reniform, attached in fours to two small membranes. Hook. fil. Fl. Br. Ind. V, 794.

Sikkim, in the bottoms of warm valleys; Pantling, No. 91; in flower during July and August. Tenasserim; at Moulmein, Falconer, Parish.

The flowers are white throughout except for some red spots on the apex of the column and on the side lobes of the lip; they are very fragrant. The species has not hitherto been recorded from Sikkim; its nearest allies are *E. barbata*, Reichb. fil. and the Philippine *E. stellata*.

PLATE 168.—*Eria fragrans*, Reichb. fil. A plant; *of natural size*. Fig. 1 front view of a flower, 2 floral bract, apex of ovary, column and lip, seen from the side, 3 lip, 4 column with its foot, the anther *in situ*, 5 lower surface of empty anther, 6 pollinia, side and front views; *all enlarged*.

11. ERIA CONFUSA, Hook. fil. Ic. Plant., t. 1850; Fl. Br. Ind. V, 796.

Pseudo-bulbs elongate-clavate, furrowed, imbricately sheathed at the base and with two or three large sheaths 4 to 6 in. long scattered along their surfaces. *Leaves* three or more, thickly membranous, oblong-lanceolate, tapering to the base; length 4 to 5 in., breadth ·6 to ·8 in. *Racemes* from the axils of the sheaths below the leaves, 2 to 3 in. long, their rachises puberulous. *Flowers* ·4 in. across; *floral bract* large, ovate, glabrous, longer than the puberulous long-stalked ovary, deflexed. Dorsal *sepal* elliptic, blunt; the lateral pair broadly ovate, blunt, spreading, all 5-nerved. *Petals* narrower than the dorsal sepal, 5-nerved. *Lip* 3-lobed; the lateral lobes broad, rounded; the apical lobe reniform, decurved; the disc with three ridges, the lateral ones short and

ending with the side lobes, the central one long, extending to the apical lobe. *Mentum* conical. *Column* rather short, its foot about the same length, slightly curved. *Pollinia* compressed, attached to two vertical elongated membranes. *Eria Andersoni*, Hook. fil. Ic. Plantar, t. 2069; Fl. Br. Ind. V, 795 (*in part*). *E. excavata* (*in part*), Lindl., Gen. and Spec. Orch., 67; Wall. Cat., 1974.

Sikkim, at elevations of about 1,500 feet in the valley of the Teesta; Pantling, No. 257; in flower during April.

The sepals and petals are dull yellow with reddish-brown nerves. The lip has similar colouration, except that the apical lobe is bright yellow with brown margins.

After most careful examination of all the available material both in the field and in the Herbarium, we have been forced to the conclusion that *E. confusa*, Hook. fil., covers for the most part the *E. Andersoni* of the same author. The colour of the sepals and petals of this species is ochraceous with brown stripes, the posterior part of the lip being purplish-brown and the anterior lobe yellow flushed with brown.

PLATE 169.—*Eria confusa*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, 3 lip, 4 column and its foot with anther *in situ*, 5 interior of anther, 6 pollinia; *all enlarged*.

12. ERIA ACERVATA, Lindl. in Journ. Hort. Soc., 1851, 57, *with fig*.

Rhizome stout, clothed with fibrous sheaths. *Pseudo-bulbs* crowded, narrowly ellipsoid, more or less compressed, furrowed, sheathed when young and with several transverse cicatrices when adult, 1·5 to 2·5 in. long and ·6 or ·7 in. broad. *Leaves* three to five, thickly membranous, narrowly-oblong or oblanceolate-oblong, sub-acute, minutely emarginate, narrowed towards the base; length 3 to 6 in., breadth ·5 to 1 in. *Racemes* one to three, few-flowered, glabrous, from the axils and more than half as long as the leaves; the peduncle puberulous, bearing four or five lanceolate, more or less reflexed *bracts*. *Flowers* glabrous, about ·65 in. long; *floral bract* lanceolate, acuminate, only half as long as the long-stalked ovary. *Sepals* sub-equal, lanceolate, acuminate, the lateral pair falcate. *Petals* similar to the sepals, but slightly narrower. *Lip* obovate in general outline, narrowed at the base, 3-lobed; the lateral lobes oblong, blunt, slightly narrowed; the terminal sub-orbicular or ovate, with thickened entire edges; the upper surface with three parallel ridges from the base almost to the apex. *Column* and foot about equal in length. *Mentum* short, obtuse. Lindl. in Paxt. Flow. Gard. I, 170; Hook. fil. Ic. Plantar, t. 1849; Fl. Br. Ind. V, 796; Reichb. fil. in Walp. Ann. VI, 269; in Gard. Chron., 1878, 106. *Dendrobium seriatum*, Wall. MSS.

Sikkim, at elevations of about 1,500 to 2,000 feet; in flower during June and July; Pantling, No. 170. Khasia Hills; Hooker, Mann.

The flowers are white, only the terminal lobe of the lip being tinged with yellow. There is considerable variation in the size of specimens. Parish's Tenasserim specimens attributed to this species have shorter broader leaves, and probably belong to another.

PLATE 170.—*Eria acervata*, Lindl. A plant; *of natural size*. Fig. 1 front view of a flower 2 floral bract, stalked ovary, column with its foot, anther, *in situ*, and the lip, seen from the side, 3 lip, 4 front view of column and its foot with the anther *in situ*, 5 lower surface of empty anther, 6 pollinia; *all enlarged*.

13. Eria excavata, Lindl. in Wall. Cat., 1974 (*in part*).

Pseudo-bulbs oblong, tapering to each end, compressed, about 1·5 in. long, somewhat shrivelled at flowering-time. *Leaves* four to six, membranous in texture, many-nerved, elliptic-lanceolate or elliptic-oblanceolate, acute, 3 to 6 in. long and ·6 to ·75 in. broad. *Raceme* solitary, terminal, about as long as the leaves, few-flowered, the rachis more or less rufous-pubescent; peduncle long, ebracteate. *Flowers* ·35 in. long; *floral bract* slightly shorter than the tomentose stalked ovary, lanceolate, glabrescent. *Sepals* connivent, the dorsal broadly elliptic; the lateral pair longer, falcate, all rusty-pubescent externally and 3-nerved. *Petals* narrower, 3-nerved, conniving over the anther. *Lip* obovate in general outline, 3-lobed; the lateral lobes erect, rounded and with two elongate calli between them; the terminal lobe decurved, transversely oblong, its apex bilobulate, the disc rugulose. *Mentum* none. *Column* and its foot very short. *Pollinia* clavate-elliptic, attached to a single small viscus. *Capsules* ·8 in. long, oblong, ribbed. Hook. fil. Ic. Plantar. t. 1846; Fl. Br. Ind. V, 795. *E. excavata* (*in part*) Lindl., Gen. and Spec. Orchid., 67; Journ. Linn. Soc. III, 53. *E. sphærochila* and *E. flava*, var. *rubida*, Lindl. in Journ. Linn. Soc. III, 54, 49; Hook. fil. Ic. Plant, t. 1845; Fl. Br. Ind. V, 795. *Octomeria excavata*, Wall. MSS.

Sikkim, at elevations of about 6,000 to 9,000 feet; Gamble, King, Thomson; Pantling, No. 273; in flower during June. Khasia Hills, elevation 6,000 feet; G. Mann.

The flowers are of a dirty white colour, the end lobe of the lip being yellow with some red markings about its base. Wallich's specimens numbered 1974, and named *E. excavata*, consist of a mixture of this and of *E. confusa*, Hook. fil. The specific name *excavata* was given on account of the supposed concavity on the anterior surface of the column and its foot. These organs are, however, not concave in fresh specimens of the plant as it occurs in Sikkim. Sir Joseph Hooker's figures of this (Ic. Plantar, t. 1846) and of *E. alba* Lindl. (l. c. t. 1845) show that the two are closely allied. All the specimens gathered in Sikkim are, however, self-fertile. Their flowers hardly open, and the colour is poorer than in specimens collected in the Khasia Hills, the flowers of which expand freely and are not self-fertile. It is possible therefore that *E. excavata* is but a cleistogamic form of *E. alba*, and, if so, the latter name (in spite of its juniority and of the mechanical law of priority) ought to be kept up, and *E. excavata* to be made a variety of it.

Plate. 171.—*Eria excavata*, Lindl. A plant; *of natural size*. Fig. 1 a flower seen from above, 2 floral bract, ovary, column with its foot, anther *in situ*, and lip in profile, 3 upper surface of lip, 4 column and its foot, the anther having been removed, 5 under surface of anther, 6 pollinia; *all enlarged*.

14. Eria coronaria, Reichb. fil. in Walp. Ann. VI, 272.

Pseudo-bulbs tufted, thin, cylindric, 5 or 6 in. long and ·25 to ·35 in. in diam when young, with a large tubular sheath at the base. *Leaves* two, terminal, sub-opposite, sub-sessile, thickly membranous, narrowly elliptic to ovate-lanceolate, 5 or 6 in. long, and 1·25 to 1·5 in. broad. *Raceme* terminal, usually sub-horizontal, few-flowered, its peduncle short and sheathed at the base. *Flowers* four to six, 1·5 in. across; *floral bract* narrowly lanceolate, much shorter than the long-stalked slender

ovary. *Sepals* sub-equal in length, spreading; the dorsal elliptic-oblong, sub-acute; the lateral pair with broad bases attached to the sides of the column. *Petals* like the dorsal sepals, but shorter. *Lip* oblong, 3-lobed; the side lobes large, rounded; the terminal lobe small, oblong, revolute, with undulate edges and six or seven crenate ridges on its upper surface; the disc between the sids lobes with two broad dilated crenulate ridges. *Column* short, stout, longer than its tapering foot. *Anther* much vaulted, 2-celled. *Pollinia* unequal, the upper four being about half as large as the lower four, broad, compressed, united in fours by granular vertical membranes. Reichb. fil. in Gard. Chron., 1876, I, 234. *Eria suavis*, Lindl. in Journ. Linn. Soc. III, 52. *Eria cylindropoda*, Griff. Notul. III, 299. *Trichosma suavis*, Lindl. in Bot. Reg., 1842, t. 21; Hook. fil. Fl. Br. Ind. V, 827. *Cœlogyne coronaria*, Lindl. in Bot. Reg., 1841, Misc., 83.

Sikkim, at elevations of 5,000 to 6,000 feet; many collectors; Pantling, No. 27; in flower during November and December. Khasia Hills; Griffith (Kew Distrib. No. 5117) and many other collectors.

The flowers of the Sikkim plant are in the main white, the lip being flushed with purple externally and having some dark streaks of purple on the side lobes; the terminal lobe, however, is yellow. In the Khasia Hills the flowers are said to be more purple than white. They are always very sweetly scented. This plant was first (1841) referred by Lindley to *Cœlogyne*, then (1842) to *Trichosma* (a genus which he formed for its reception); but was finally (1859) removed by him to *Eria*, of which genus he formed for it the section *Trichosma*. Griffith also regarded the plant as an *Eria* and named it *E. cylindropoda*. There is therefore good authority in favour of treating this plant as an *Eria* rather than as the solitary member of a distinct genus. When Lindley changed the generic name from *Cœlogyne* to *Trichosma* he ought to have kept up the specific name *coronaria*. In consequence of his not having done so, the authorship of the species as an *Eria* falls to Reichenbach *filius*.

PLATE 172.—*Eria coronaria*, Reichb. fil. A plant; *of natural* size. Fig. 1 side view of a flower from which the sepals and petals have been removed, 2 lip, 3 column with its foot and anther *in situ*, 4 lower surface of anther, 5 pollinia; *all enlarged*.

15. ERIA STRICTA, Lindl. Coll. Bot. t. 41 B; in Journ. Linn. Soc. III, 52.

Pseudo-bulbs crowded, without a rhizome, often cohering, cylindric, 3·5 to 5 in. long and about ·3 in. in diam., with loose fibrous sheaths at the base, and at the apex two oblong elliptic sub-coriaceous sessile leaves tapering to each end, 2·5 to 4 in. long and ·5 to ·9 in. broad. *Spike* solitary, erect, rising from between the leaves and exceeding them in length, the peduncle naked, the raceme many-flowered. *Flowers* ·1 to ·15 in. long, secund, crowded; the *floral bract* ovate, acute, glabrous, much shorter than the woolly ovary. *Sepals* densely woolly outside, sub-equal, ovate. *Petals* ovate-rotund, blunt, as long as the sepals. *Lip* sub-orbicular, concave, obscurely 3-lobed; the apical lobe very short, broad, truncate; the side lobes shallow, rounded, the disc between them with a smooth depressed callus; the base gibbous and nectar-secreting, divided into two chambers by a short rib continued upwards on the foot of the column. *Column* short, broad, the foot short. *Anther* without true cells, but with depressions for the elliptic pollinia. *Pollinia* in two masses of four each, each mass attached separately to the quadrate gland by a granular elastic thread. Reichb. fil. in Walp. Ann. VI, 271;

Lindl. in Journ. Linn. Soc. III, 52; Hook. fil. Fl. Br. Ind V, 791. *E. secundiflora*, Griff. Notul. III, 302; Ic. Pl. Asiat., t 301. *Mycaranthes stricta*, Lindl. in Wall. Cat., 1970; Gen. and Spec. Orchid., 63; Wight Ic. 1733. *Octomeria secunda*, Wall. MSS.

Sikkim, common at elevations of 1,000 to 4,000 feet; in flower from November to February; Pantling, No. 65. Nepal; Wallich. Assam; in the Naga and Khasia Hills.

The flowers are white flushed with pink, the column being yellow and the sides of the lip inside being streaked with the same tint.

This is quite an anomalous species of *Eria*, the attachment of the pollinia by elastic threads to a gland being suggestive of *Vandeae*, to which tribe it ought probably to be removed to form the type of a new genus allied to *Cryptochilus*.

PLATE 173.—*Eria stricta*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 part of ovary, column and lip, 3 lip, 4 column showing the anther *in situ* and stigma, 5 anther, 6 pollinia; *all enlarged*.

16. ERIA PANICULATA, Lindl. in Wall. Pl. As. Rar. I, 32, t. 36.

Stems coespitose, pendulous, one to two feet long and about as thick as a goose-quill. *Leaves* numerous, fleshy, linear, acuminate, sessile, ·2 to ·5 in. broad. *Racemes* in terminal fascicles of two or three, about as long as the leaves, with long lanceolate *bracts* at their bases, woolly, many-flowered. *Flowers* ·25 to ·3 in. across; *floral bract* lanceolate, acuminate, curved, glabrous, nearly as long as the pubescent stalked ovary. Dorsal *sepal* ovate; the lateral pair triangular, sub-falcate, spreading, all softly and sparsely pubescent outside. *Petals* about as long as the dorsal sepal, elliptic-obovate, the edges slightly erose. *Lip* in general outline sub-orbicular, 3-lobed, the base with a large mealy callus in front of the column; lateral lobes oblong, sub-falcate, their apices sub-acute and directed forwards; apical lobe broad, coarsely erose, much decurved, bearing on its upper surface a callus like that at the base but larger. *Column* stout, with a narrow straight foot about as long as itself. *Anther* imperfectly 8-celled, much shrunken when the flowers expand and only partly covering the eight clavate pollinia. *Pollinia* attached to a broad viscid mass. Wall. Cat., 1971; Lindl., Gen. and Spec. Orch., 65; Bot. Reg. XXVIII (1842), Misc. 38; in Journ. Linn. Soc. III, 55; Reichb. fil. in Walp. Ann. VI, 274; Hook. fil. Fl. Br. Ind. V, 789.

Sikkim, at elevations of from 2,000 to 4,000 feet; Hooker, Thomson and others, Pantling, No. 103; in flower from January to April. Khasia Hills; Griffith (Kew Distrib. No. 5111), Prain, Simons. Sylhet; Wallich. Naga Hills; Prain.

The sepals are of a pale yellowish-green colour; the petals, lip and column are pale lavender with brownish blotches. The callus on the lip is white and has a mealy appearance. In Sikkim the flowers are in racemes which arise in fascicles. Wallich's figure of the Nepal plant shows them as forming a short panicle.

PLATE 174.—*Eria paniculata*, Lindl. A plant; *of natural size*. Fig. 1 a flower, front view, 2 floral bract, stalked ovary, column with its foot, anther *in situ* and lip, side view, 3 lip, 4 summit of column with the anther curled up and showing the pollinia *in situ*, and stigma, 5 pollinia; *all enlarged*.

17. ERIA FLAVA, Lindl. in Wall. Cat., 1973, (*in part*); Gen. and Spec. Orch. 65.

Rhizome stout, clothed with imbricating tubular sheaths. *Pseudo-bulbs* vertically furrowed, sheathed at the base, much compressed, 3 to 4 in. long and 1·25 in. in diam.

Leaves three to five, sub-coriaceous, more or less narrowly oblong, acuminate, tapering to the base; length 6 to 9 in., breadth ·75 to 1·5 in. *Racemc* from the base of the pseudo-bulb, erect, stout, covered with dense pale soft tomentum, about as long as the leaves and with several sheaths at the base. *Flowers* distant, ·6 in. long; *floral bract* lanceolate, much shorter than the tomentose stalked ovary, shrivelled when the flowers open. *Sepals* tomentose externally, the dorsal small, lanceolate; the lateral pair much larger, triangular, spreading. *Petals* lying parallel over the column, narrowly oblong, narrowed at base and apex, smaller than the dorsal sepal. *Lip* oblong, 3-lobed; the side lobes narrow with truncate apices, puberulous and with two long tapering ridges at their junction with the disc; the terminal lobe oblong, acute, deflexed, slightly 2-ridged, glabrous. *Column* erect, its foot at right angles to and longer than itself. *Lip* of anther with a small quadrate appendage. *Pollinia* small, compressed, attached to two granular membranes. *Capsule* narrowly cylindric, 1·5 to 1·75 in. long. Lindl. in Journ. Linn. Soc. III, 49 (*excl. var. B.*); Hook. fil. Fl. Br. Ind. V, 801. *E. laniceps*, Reichb. fil. in Hamb. Gartenzeit, XIX, 10. *Dendrobium pubescens*, Hook. Exot. Flora, t. 124. *Octomeria flava*, Wall. MSS. *O. pubescens*, Spreng. Syst., t. IV. 310.

Sikkim, in low warm valleys and at the base of the range, common; Pantling, No. 130; in flower during April. Westwards as far as Kumaon and eastwards to Bhutan. A variety named *lanata*, with smaller flowers and darker coloured lip, is found in Tenasserim; it was regarded as a species by Lindley.

The sepals and petals of the Sikkim plant are green, and the basal half of the lip is purple on both surfaces; the foot of the column has a blotch of the same colour. In specimens from Nepal and Kumaon the flowers are yellow. The leaves when dry have often numerous small concretions on their surfaces.

PLATE 175.—*Eria flava*, Lindl. A plant; *of natural size.* Fig. 1 a flower, 2 floral bract, stalked ovary, column and its foot and the lip, seen from the side, 3 lip, 4 column, 5 lower surface of anther, 6 pollinia; *all enlarged.*

18. ERIA PANNEA, Lindl. in Bot. Reg., 1842, Misc. 64; in Journ. Linn. Soc. III, 50.

Rhizome as thick as a crow-quill, woolly; stems very short, 1- to 4-leaved. *Leaves* fleshy, cylindric, pointed at the apex, 3 to 7 in. long, and ·2 to ·25 in. in diam. Peduncle terminal, 1 to 2 in. long, woolly, 1- to 4-flowered. *Flowers* about ·5 in. long; *floral bract* large, ovate; the ovary pubescent, sessile. *Sepals* spreading, densely covered with white wool externally like the ovary and bract; the dorsal broadly elliptic, sub-acute; the lateral pair ovate-triangular, sub-acute, sub-falcate. *Petals* elliptic, sub-acute, slightly pubescent, spreading. *Lip* fleshy, oblong, obtuse, not lobed, concave, downy, with oblong granular calli near the base and apex, the edges sub-undulate. *Mentum* rather long, obtuse. *Column* short, pubescent outside; the foot long, curved, concave, glabrous. *Pollinia* clavate, in two groups, each group united to a very small granular appendage. Walp. Ann. VI, 273; Hook. fil. Fl. Br. Ind. V, 804. *E.? teretifolia*, Griff. III, 298; Ic. Pl. Asiat., t. 300.

Sikkim, in tropical valleys and along the base of the range; in flower during May; Pantling, No. 144. Tenasserim; Parish. Perak; Scortechini, Ridley. Malacca; Lobb. Distrib. Borneo.

The outer surfaces of the sepals and petals are covered with white wool; the inner surfaces which are smooth are of different shades of golden brown, the lip is dark brown, the edges being paler; the column is green, and the foot tinged with orange.

PLATE 176.—*Eria pannea*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 part of ovary, column and its foot, anther *in situ* and lip, 3 lip, 4 front view of column and its lip and the anther, 5 anther seen from below, 6 polliuia; *all enlarged*.

19. ERIA DASYPHYLLA, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 147.

Stems creeping on trees, much branched, about ·1 in. thick, the older with long brown hispid pubescence, the younger branches with shorter paler hairs. *Leaves* small, fleshy, sessile, elliptic-ovate or obovate, covered with short whitish wool mixed with long hispid hairs, length ·35 to ·7 in, breadth from ·15 to ·35 in. *Flowers* ·4 or ·5 in. long, solitary, on short pubescent sheathed peduncles; *floral bract* lanceolate, shorter than the stalked ovary. *Sepals* pubescent externally, unequal; the dorsal small, erect, elliptic; the lateral pair large, broadly triangular, concave. *Petals* oblong, blunt. *Lip* large, cuneately oblong, ciliolate, the base narrowed, the side lobes very shallow; the terminal half deflexed its apex broad, slightly emarginate and minutely erose. *Mentum* broad. *Column* short, the foot long, slightly curved. *Anther* conical, its lip broad and truncate. *Pollinia* sub-cuneiform. Hook. fil. Fl. Br. Ind. V, 808.

Sikkim, in tropical valleys up to elevations of 3,000 feet; in flower during May and June; Pantling, No. 90; Griffith (Kew Distrib.) No. 5131. Khasia Hills, alt. 1,000 to 2,000 feet; Hooker and Thomson. Pegu; Kurz, Helfer.

The flowers are green slightly flushed with yellow, and at the base of the lip there is a large patch of brownish-purple.

PLATE 177.—*Eria dasyphylla*, Par. and Reichb. fil. Piece of a young stem of a plant with leaves and flowers; *of natural size*. Fig. 1 a flower, 2 scape and bracts, ovary, column with its foot, anther and lip, seen from the side, 3 lip, 4 column with its foot, anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

20. ERIA RUFINULA, Reichb. fil. in Hamb. Gartenzeit XIX, 13.

Stem cylindric, 10 to 12 in. long, leafy, pendulous, rufous-hispid. *Leaves* numerous, coriaceous, narrowly lanceolate, acuminate, sparsely rusty-pubescent, 2·5 to 4 in. long, and about ·5 in. broad, often with superficial concretions when dry. *Racemes* leaf-opposed, about ·75 in. long, bearing three to six flowers about ·3 in. in length; *floral bract* large, cordate, acute, hispid, exceeding the sessile ovary. *Sepals* sub-equal, ovate-lanceolate, sub-acute, spreading, hispid externally. *Petals* narrower than the sepals, spreading, sparsely hispid. *Lip* spathulate, not lobed, the edges slightly upturned, the posterior half scabrid, the anterior half thickened, smooth except for a small elongate callus near the apex. *Column* rather long, narrowed towards the short sigmoidly curved foot. *Anther* with lobulate lip. *Pollinia* oblong, cohering by two granular membranes. Hook. fil. Fl. Br. Ind. V, 808. *E. annulata*, Lindl. (*not of Blume*) in Journ. Linn. Soc. III, 57.

Sikkim, in tropical valleys up to elevations of 2,500 feet; in flower during May? Pantling, No. 287. Khasia Hills, at an elevation of 4,000 feet, G. Mann? Tenasserim; Helfer. Cachar; Keenan.

The flowers are whitish flushed with pink, the lip being blotched with red at the base and the anther deep crimson. The bract and ovary are green.

PLATE 178.—*Eria rufinula*, Reichb. fil. A plant; *of natural size*. Fig. 1 a flower, front view, 2 floral bract, ovary, column, foot, anther and lip, 3 lip, 4 anther, 6 pollinia; *all enlarged*.

21. ERIA CARINATA, Gibs. in Calc. Journ. Nat. Hist. V, 365.

Rhizome very short, woody, covered with dark scarious sheaths. *Pseudo-bulbs* oblong-ovoid, furrowed when mature, 2 to 3 in. long and about 1 in. in diam. *Leaf* thickly coriaceous, elliptic-oblong, acute, tapering at the base into the long channelled petiole; length of blade 7 to 12 in., of petiole 1·5 to 3·5 in., breadth of blade 1·5 to 2 in. *Inflorescence* borne on an undeveloped pseudo-bulb, 6 to 12 in. long; the peduncle enveloped in the conduplicate young leaf, sheathed by numerous large equitant *bracts* 1 to 3 in. long. *Raceme* about 3 in. long, bearing three drooping polished flowers 1 in. long; *floral bract* narrowly lanceolate, 1 to 1·5 in. long and longer than the three-winged stalked ovary. *Sepals* lanceolate, shortly keeled, slightly spreading, the dorsal rather shorter; the lateral pair gibbous at the base, their keels denticulate near the apex. *Petals* oblong-rhomboid, 9-nerved. *Lip* oblong, decurved from the middle, the side lobes narrow; the terminal lobe oblong, apiculate, much recurved, the upper surface with a ridge along the middle from base to apex and two shorter lines between the side lobes. *Mentum* short, rounded. *Column* much curved, its foot shorter than itself but broader. *Anther* with a thickened crest and a bilobed lip. *Pollinia* elliptic, attached to a broad granular membrane. Lindl. in Journ. Linn. Soc. III, 50; Hook. fil. Fl. Br. Ind. V, 808. *E. rosea*, Wall. Cat. 7409 (*not of Lindl.*); Reichb. fil. in Walp. Ann. VI, 269 (*in part*). *E. Fordii*, Rolfe in Gard. Chron. 1886, II, 584. *Xiphosium acuminatum*, Griff. Notul. III, 332; Itin. Notes II, 78, No. 1153; Ic. Plant. Asiat., t. 316.

Sikkim, at elevations of 500 to 3,000 feet; Elwes and others; Pantling, No. 1; in flower from November to January. Nepal; Wallich. Khasia Hills; Griffith (Kew Distrib. 5121), Mann, Rita.

The sepals are yellowish-green, the petals yellowish, the lip a pale faded purple, and the column pale yellow and white. The flowers smell of paregoric.

PLATE 179.—*Eria carinata*, Gibs. A plant; *of natural size*. Fig. 1 the petals, 2 part of ovary, column and its foot, anther *in situ* and lip seen from the side, 3 lip, 4 column and its foot and anther, 5 outside of anther; 6 pollinia; *all enlarged*.

20. Tylostylis, Blume.

Stem thick, fleshy, furrowed, constricted and leaf-bearing at the nodes. *Leaves* several, coriaceous, sessile. *Flowers* small, in extra-axillary or axillary racemes. *Sepals* oblong-elliptic, pubescent, spreading. *Petals* smaller than the sepals. *Lip* articulated to the very short foot of the column, mobile, broad, not lobed, much deflexed, pubescent. *Column* very long, much curved forwards and downwards, so that its apex is brought opposite the middle of the lip, bearing a large callus at its base and on the very short foot. *Pollinia* 8, sub-equal, sub-orbicular, compressed, attached to four elongated membranes. Distrib. Two species, one Indian and the other Malayan.

This genus was first published (1825) by Blume in his Bijdragen (p. 340, t. 74) as *Callostylis*. But, on the ground that the name is Græco-Latin, he changed it (1828) in his Flora Javæ, praef. VI, to *Tylostylis*. The genus contains two species, the original Malayan one of Blume (*T. rigida*)

and the Indian one here described. The genus was maintained by the late Mr. Bentham (Gen. Plantar. III, 318), but was reduced by Sir J. D. Hooker in his Flora of British India to *Eria*, where it was placed in the section *Dendrolirion*. The latter author, in describing the Indian species as an *Eria* in the Annals of the Calcutta Garden (V, 22), suggested the probability of its having to be removed from that genus; and, in his Flora of British India V, 785, he stated that, should an examination of living flowers prove the lip to be mobile, *Tylostylis* ought to be reinstated as a genus. Having satisfied ourselves that the lip is mobile, we accordingly adopt for the plant the name suggested for it by him (Ann. Bot. Gard. Calc. V, 22).

TYLOSTYLIS DISCOLOR, Hook. fil. in Ann. Bot. Gard. Calc. V, 22.

Rhizome thick, woody, bearing short distant tubular sheaths. *Stem* thick, furrowed, constricted and leaf-bearing at the nodes, 3 to 10 in. long and 1 to 1·25 in. in diam. near the base. *Leaves* five or six, coriaceous, many-nerved, narrowly oblong, blunt or sub-acute and emarginate, not contracted at the base, 4 to 6 in. long and ·9 to 1·2 in. broad. *Racemes* from beneath the leaves and shorter than them, erect, few-flowered, with a stout tomentose rachis, the peduncle longer than the raceme and with distant broad sheathing sub-glabrous *bracts*. *Flowers* few, ·4 in. long; *floral bract* thick, broadly elliptic, glabrous, much shorter than the pubescent stalked ovary. *Sepals* shortly pubescent on the outer and slightly so in the inner surface, thick, sub-equal, spreading, oblong-elliptic, obtuse. *Petals* narrowly obovate, obtuse, smaller than the sepals, sub-glabrous, spreading. *Lip* mobile, broadly cordate, articulated to the foot of the column by a claw, not lobed, the disc near its base with a square shining patch on the foot above the claw, the rest of the upper surface pubescent, the edges upturned. *Mentum* none. *Column* long, much curved downwards and forwards, the foot very short and with a large dark-coloured callus. *Anther* depressed. *Pollinia* attached to four elongated membranes. *Eria discolor*, Lindl. in Journ. Linn. Soc. III, 51; Hook. fil. Fl. Br. Ind. VI, 190; in Ann. Roy. Bot. Gard. Calc. V, 22, t. 32. *E. pulchella*, (*in part*) Hook. fil. Fl. Br. Ind. V, 802.

Sikkim, at elevations of from 500 to 3,500 feet; Pantling, No. 127; in flower during February. Khasia Hills; Simons.

The colour of the inner surfaces of the sepals, petals and of the column is ochraceous-yellow, their outer surfaces being dull white. The foot of the column is of a dark leaden colour and the lip has a dark purplish-brown patch near its base.

PLATE 180.—*Tylostylis discolor*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, front view 2 lip, 3 bract, stalked ovary, column with its foot, anther *in situ* and lip, seen from the side 4 column with pollinia and stigma, front view, 5 empty anther, showing the septa, 6 and 7 pollinia; *all enlarged*.

21. Cœlogyne, Lindl.

Epiphytes; *pseudo-bulbs* coespitose or attached to a rhizome, 2- (or rarely 1-) leaved. *Leaves* coriaceous, or membranous and plicate. *Inflorescence* racemose, from the apex or base of the adult pseudo-bulb. *Flowers* without mentum or spur; *floral bract* large, deciduous. *Sepals* sub-equal, spreading, more or less lanceolate or oblong. *Petals* narrower, sometimes linear. *Lip* sessile on the base of the column, or very shortly clawed (in *C. uniflora*), sometimes saccate at the base, oblong and 3-lobed or sub-orbicular and without lateral lobes. *Column* long, erect, straight or curved, winged and often hooded

in its upper part, foot none. *Anther* more or less 2-celled. *Pollinia* 4, cohering in pairs to a single two-lobed granular appendage. Species about 90; Indian and Malayan.

I.—Eu-Cœlogyne. Lip oblong, 3-lobed; flowers and leaves contemporaneous, the latter persistent; flowers in racemes (solitary in *C. uniflora*).

Inflorescence racemose from the base of the pseudo-bulb; leaves in pairs, petals lanceolate or oblong.

Leaves elliptic, 2 to 4 in. broad; flowers pale brown . . . . *1. C. fuscescens.*

Leaves narrowly elliptic or narrowly oblong, less than 2 in. broad; flowers usually white.

Pseudo-bulbs 2 to 4 in. long; racemes with seven to nine flowers.

Lip with two smooth ridges; raceme erect, lengthening when in fruit . . . . . *2. C. ochracea.*

Lip with three flexuose ridges, not fimbriate, raceme drooping . . . . . *3. C. flaccida.*

Lip with four long-fimbriate lamellæ, raceme drooping . *4. C. cristata.*

Pseudo-bulbs 1 to 1·5 in. long; racemes erect with only two to four flowers.

Peduncle of raceme 3 in. long, lengthening when in fruit, enveloped in sheathing bracts; racemes curved, 3- or 4-flowered . . . . . *5. C. corymbosa.*

Peduncle of raceme 4 in. long, lengthening when in fruit, completely enveloped in large wide sheathing bracts . . . . . *6. C. occultata.*

Inflorescence racemose from between the pair of leaves on the apex of a fully developed pseudo-bulb; petals linear.

Flowering axis bracteate at its base; lip fimbriate . . . *7. C. ovalis.*

Flowering axis naked below, but with numerous imbricate distichous small sheaths below the 6- to 12-flowered raceme, proliferous (*i.e.*, flowering in successive years from a prolongation of the same axis).

Lip with two lacerate lamellæ, the terminal lobe with erose edges . . . . . *8. C. elata.*

Lamellæ of lip not lacerate-fimbriate, the terminal lobe with undulate not erose edges; flowers yellow.

Pseudo-bulbs cylindric, tapering to each end, thin, much elongate; flowers greenish . *9. C. longipes.*

Pseudo-bulbs ovoid.

Leaves sessile or sub-sessile; base of lip only slightly concave. . . . . *10. C. prolifera.*

Leaves with long petioles; base of lip very concave . . . . . *11. C. flavida.*

Flowers solitary on a short peduncle from the base of and not longer than the pseudo-bulb . . . . . *12. C. uniflora.*

II.—Pleione. Lip more or less orbicular or reniform, without side lobes; peduncles from the base of the adult pseudo-bulb and bearing only one or at most two flowers; leaves solitary or in pairs.

Flowers and leaves contemporaneous, leaf solitary . . . *13. C. Hookeriana.*

Flowers and leaves not contemporaneous, the latter deciduous.		
Pseudo-bulbs elongated, ovoid, leaf usually solitary .	*14.*	*C. humilis.*
Pseudo-bulbs more or less turbinate, umbonate, leaves in pairs.		
Flowers 2 to 3 in. across, white	*15.*	*C. maculata.*
Flowers 3 to 4 in. across, rose-coloured . . .	*16.*	*C. præcox.*

1. Cœlogyne fuscescens, Lindl. in Wall. Cat., 1962; Gen. and Spec. Orch., 41.

Pseudo-bulbs long, cylindric, furrowed, shortly sheathed at the base, about 1 in. apart on a stout rhizome 3 or 4 in. long, and about ·75 in. in diam. *Leaves* in pairs, elliptic, plicate, acute, narrowed to the shortly petioled base, 6 to 9 in. long and 2 to 4 in. broad. *Raceme* rather shorter than the leaves (longer in fruit), drooping, 4- to 10-flowered; the peduncle stout, rising from the rhizome, enveloped for more than half its length in imbricate sheaths. *Flowers* about 1·5 in. long, pale brown; *floral bract* broadly ovate, acute, longer than the stalked ovary, caducous. *Sepals* sub-equal, erecto-patent, oblong-lanceolate, acute, rather concave. *Petals* linear, acute, reflexed, about as long as the sepals. *Lip* oblong; the basal half concave, with two broad rounded recurved side lobes; the anterior part wider than the basal and not separated from it by any constriction, broadly ovate, elliptic, obtuse, the edges undulate; the disc between the side lobes with three bold smooth ridges. *Column* long, curved, erosely winged at the apex. *Pollinia* dimidiately obovoid. *Capsule* pyriform, 1·25 in. long. Lindl. Fol. Orchid., 11; Bot. Mag., t. 5494 (var. *brunnea*); Walp. Ann. VI, 231; Hook. fil. Fl. Br. Ind. V, 833. *C. brunnea*, Lindl. in Gard. Chron., 1848, 71, *with fig.* *C. assamica*, Lindl. ex Reichb. fil. in Koch Allgem. Gartenzeit, 1857, 503; Xen. Orchid. II, t. 134.

Sikkim, at elevations of 3,000 to 5,000 feet; flowering from October to December; Pantling, No. 22. Nepal; Wallich, Maries. Bhutan; Griffith, No. 5198 (Kew Distrib.), Clarke; Khasia Hills, Simons. Burma; Parish.

In the Sikkim plant the flowers are of a pale brown colour, the ridges on the disc of the lip being of a darker shade. There are also two spots of a still darker brown on the side lobes and two on the anterior lobe, besides some dark dots; the floral bract also is brown. In other provinces the colour varies to brownish-green or yellowish, the lip being spotted with brown.

Plate 181.—*Cœlogyne fuscescens*, Lindl. A plant; fig. 2 bract, 6 capsule, 7 transverse section of the same; *of natural size.* 1 lip, 3 column with the anther *in situ*, 4 anther, 5 pollinia; *all enlarged.*

2. Cœlogyne ochracea, Lindl. in Bot. Reg., 1846, t. 69.

Pseudo-bulbs on a stout rhizome, ovate-oblong to cylindric, furrowed, 3 to 4 in. long and ·75 in. in diam. *Leaves* narrowly oblong, acute, narrowed to the channelled petiole, 6 to 8 in. long and ·8 to 1·25 in. broad; petiole 1·5 to 2·25 in. long. *Raceme* from the base of the old pseudo-bulb, erect, shorter than the leaves (longer in fruit), 6- to 8-flowered; its peduncle stout and with several large imbricating sheaths. *Flowers* white, 1·5 in. in diam.; the *bract* oblong, convolute, sheathing, longer than the slender stalked ovary, caducous. *Sepals* sub-equal, oblong-lanceolate to ovate-lanceolate, obtuse, spreading, the petals narrower. *Lip* oblong, constricted about the

middle; lateral lobes large, rounded, incurved, the edges serrulate; terminal lobe rotund to oblong, blunt, entire or very slightly notched at the apex, the disc with two ridges. *Column* broadly winged towards the apex. *Pollinia* broadly oblong, compressed. *Capsule* narrowly clavate, 1·75 in. long. Lindl. Fol. Orch. 5; Bot. Mag., t. 4661; Walp. Ann. VI, 226; Hook. fil. Fl. Br. Ind. V, 831.

Sikkim, at elevations of from 4,000 to 7,000 feet; common; in flower during May and June; Pantling, No. 76. Westward to Kumaon and eastward to Bhutan and the Assam hill ranges.

The sepals and petals are pure white, the upper surface of the lip has two elongated blotches of yellow margined with red on its side lobes and two united orbicular spots at the base of the terminal lobe, with reddish oblique lines on the outer surface of the side lobes; the column is white with a vertical yellowish-brown band in front. The flowers are fragrant.

PLATE 182.—*Cœlogyne ochracea*, Lindl. Fig. 1 floral bract; of *natural size*, 2 lip, 3 column with anther *in situ*, 4 empty anther, 5 pollinia; *all enlarged*.

3. CŒLOGYNE FLACCIDA, Lindl. in Wall. Cat., 1961; Gen. and Spec. Orch., 39.

Pseudo-bulbs ovoid-cylindric, with large fibrous brown sheaths at the base, 2 to 6 in. long and ·8 to 1 in. in diam. *Leaves* thinly coriaceous, in pairs, narrowly oblong, acuminate, narrowed into a long channelled petiole, length 4 to 6 in., breadth ·75 to 1·25 in., the petiole 1·5 to 2 in. *Raceme* from the base of the pseudo-bulb, decurved, many-flowered, lax, as long as the leaves; its peduncle short and with large lax sheaths at the base. *Flowers* 1·5 in. across (vertically); *bracts* obovate-cymbiform, acute, ·75 to 1 in. long, caducous. *Sepals* sub-equal, oblong-lanceolate, acute, spreading. *Petals* narrower and shorter than the sepals, acute. *Lip* oblong, 3-lobed; the side lobes long, with acute apices; the terminal lobe oblong, reflexed; the disc with three yellow flexuose ridges between the side lobes. *Column* long, broadly and erosely hooded at the apex. *Pollinia* oblong. *Capsule* ellipsoid, tapering to both ends but especially to the lower, winged, 1·5 to 1·75 in. long. Lindl. in Bot. Reg., 1841, t. 31; Fol. Orchid. 2; Bot. Mag., 3318; Walp. Ann. VI, 223; Hook. fil. Fl. Br. Ind. V, 829.

Sikkim, at elevations of 3,000 to 5,500 feet; common; Pantling, No. 136; in flower from March to May. Nepal; Wallich. Khasia Hills and Burma.

The sepals and petals are of a pale brown colour; the lip is of a darker brown, the terminal lobe however being white with a yellow patch near its base; the lamellæ are yellow. The column is white with a broad yellow streak in front and the anther is buff-coloured. The flowers have a disagreeable smell.

PLATE 183—*Cœlogyne flaccida*, Lindl. A plant; *of natural size*. Fig. 1 flower, 2 lip, 3 floral bract, 4 column with anther *in situ*, 5 anther, 6 pollinia, *all enlarged*, 7 capsule; *of natural size*.

4. CŒLOGYNE CRISTATA, Lindl. Coll. Bot. t. 33.

Pendulous; *pseudo-bulbs* rising from a long stout rhizome, rather distant, ovoid-cylindric, polished, sheathed at the base, 2 to 3 in. long and about ·85 in. in diam. *Leaves* in pairs, linear-oblong, acute, narrowed to the sessile base, 6 to 10 in. long and about ·8 in. broad. *Racemes* from the base of the pseudo-bulbs, pendulous, about as long

as the leaves, few-flowered, their bases sheathed with numerous small bracts. *Flowers* large, white, 2 to 3·5 in. across; *bract* oblong, acute, concave, as long as or longer than the long-stalked ovary. *Sepals* and *petals* sub-equal, erecto-patent, oblong, obtuse or sub-acute, with entire undulate edges. *Lip* oblong, with large rounded lateral lobes; the terminal lobe separated by an isthmus from the lateral, broad, short, crenate, with two broad, square, yellow lamellæ on its upper surface; disc between the side lobes with four yellow fimbriate lamellæ. *Column* long, the apex hooded and crenate. *Anther* with a sub-acute lip. *Pollinia* 4, narrowly oblong, compressed. *Capsule* narrowly clavate, 2 in. long. Lindl. in Bot. Reg., 1841, t. 57; Fol. Orchid. 8; Walp. Ann. VI, 229; Paxt. Fl. Gard. III, 171, f. 312; Fl. des Serres, t. 1807; Pescatoria I, t. 25; Warner's Sel. Orch. I, t. 35; Orch. Alb., t. 54; Jennings' Orch., t. 7; Gartenfl. VIII, t. 245; Hook. fil. Fl. Br. Ind. V, 829.

Sikkim, at elevations of 5,000 to 8,000 feet; common; in flower during March and April; Pantling, No. 104. Westward along the range to Kumaon, and eastward to Bhutan. Khasia Hills.

The flower is pure white throughout, with the exception of the lamellæ of the lip which are yellow. The depth of the yellow varies, and a variety has been founded for the form in which it is very pale.

PLATE 184.—*Cœlogyne cristata*, Lindl. A plant. Fig. 1 a capsule; *both of natural size*, 2 apex of ovary column and lip seen from the side, 3 lip, front view, 4 column with the anther *in situ*, 5 empty anther, 6 pollinia; *all enlarged.*

5. CŒLOGYNE CORYMBOSA, Lindl. Fol. Orchid., 7.

Pseudo-bulbs rather crowded on a stout rhizome, ovoid or obovoid, slightly sheathed at the base, 1 to 1·5 in. long. *Leaves* narrowly elliptic-oblong, acute, narrowed to the sessile base, 4 to 7 in. long, and ·8 to 1·25 in. broad. *Raceme* shorter or longer than the leaves, decurved, its peduncle enclosed in large sheaths. *Flowers* three or four, large, lax, white, 2·25 in. across; *floral bract* lanceolate, as long as the stalked ovary. *Sepals* and *petals* sub-equal, lanceolate; the petals rather narrower. *Lip* oblong, much contracted about the middle, the lateral lobes broad and blunt; the terminal lobe ovate, the apex acuminate and recurved, crenulate towards the base and the disc with three lamellæ. *Column* curved, slightly winged towards the apex. *Pollinia* falcate-elliptic, compressed. *Capsule* clavate, 1·5 in. long. Bot. Mag., t. 6955; Walp. Ann. VI, 228; Hook. fil. Fl. Br. Ind. V, 831; Reichb. fil. in Gard. Chron., 1876, II, 8; Rolfe l.c. 1887, II, 73. f. 15.

Sikkim, at elevations of from 6,000 to 8,500 feet; in flower during April and May, common; Pantling, No. 77. Bhutan, Khasia Hills.

The sepals and petals are pure white; the posterior part of the lip is brown, the middle part has four yellow blotches and the terminal part is white. The side lobes of the lip are sometimes erose at the margin as is (in other specimens) the base of the middle lobe. This species is often confounded with *C. occultata* and *C. nitida*. The flowers are sweet-scented.

PLATE 185.—*Cœlogyne corymbosa*, Lindl. A plant; *of natural size*. Fig. 1 lip, 2 column with the anther *in situ*, 3 empty anther, 4 pollinia; *all enlarged.*

6. Cœlogyne occultata, Hook. fil. Ic. Plant. t. 2104.

Pseudo-bulbs obliquely attached to a rhizome ·25 in. thick, obovoid or ellipsoid, polished, 1 to 1·5 in. long. *Leaves* in pairs, narrowly elliptic, acute, narrowed to the variable petiole, length 2·25 to 3·5 in., breadth ·75 to 1 in., petiole ·35 to ·75 in. *Raceme* from the base of the pseudo-bulb, longer than the leaves, erect, short, 2- or 3-flowered; the peduncle much longer than the pseudo-bulbs, enveloped almost to the top in wide spathaceous *bracts* which enclose at the summit the two young leaves. *Flowers* 2 in. in diam., white; *floral bract* oblong, cymbiform, acute, longer than the stalked ovary. *Sepals* and *petals* sub-equal in length; the petals narrower, oblong-lanceolate, acute, spreading. *Lip* oblong; the lateral lobes large, rounded, crenulate in front, separated by a constriction from the oblong, acute, recurved entire terminal lobe; disc between the side lobes with two large thick crenate ridges and a short small one between them at the anterior end. *Column* with a broad hood-like winged apex. *Pollinia* obovate. Hook. fil. Fl. Br. Ind. V, 832.

Sikkim, at elevations of from 6,000 to 7,500 feet; in flower during July; Pantling, No. 213; Griffith, No. 5195 (Kew Distrib.)

The flower is white with the exception of some streaks and a large blotch of yellow on the lip. This is closely allied to *C. corymbosa*, Lindl., but differs in having shorter peduncles which are more completely enveloped in sheathing bracts larger and wider than those of that species. The racemes are also more erect and have fewer flowers, and the latter are inodorous.

Plate 186.—*Cœlogyne occultata*, Hook. fil. **A** plant; *of natural size*. Fig. 1 lip, 2 column with anther *in situ*, 3 empty anther, 4 pollinia, *all enlarged*, 5 capsule, 6 transverse section of the same; *both enlarged*.

7. Cœlogyne ovalis, Lindl. in Bot. Reg., 1838, Misc. 91.

Pseudo-bulbs long, cylindric, slightly thickened towards the sheathed base, polished, 1·5 to 3·5 in. long, rising at distances of 2 to 4 in. from a rather stout imbricately sheathed rhizome. *Leaves* in pairs, thinly coriaceous, elliptic-oblong, acute, tapering at the base into the short petiole; length 4 to 5 in., breadth 1 to 1·5 in. *Inflorescence* terminal, bearing three flowers which expand singly. *Flowers* about 2 in. across; *floral bract* coriaceous, 1·25 in. long, ovate-lanceolate, convolute, caducous. *Sepals* sub-equal, ovate-lanceolate, acute, spreading. *Petals* linear, blunt, spreading or reflexed. *Lip* oblong; the lateral lobes narrow, recurved; the terminal lobe broadly oblong, its edges and upper surface with stiff black hairs; the disc with two crisped lamellæ from base to apex. *Column* curved, broadly winged in its upper half. *Pollinia* dimidiately obovate. Lindl., Fol. Orch. 12; Walp. Ann. VI, 232; Hook. fil. Fl. Br. Ind. V, 836; Ann. Bot. Gard Calc. V, 28, t. 41. *C. fimbriata*, Lindl. in Wall. Cat., 1957. *C. fimbriata?* Lindl., Griff. Notul. III, 281; Ic. Plant. Asiat., 291, fig. 1? *C. pilosissima*, Planch. Hort. Donat, 104. *Broughtonia liniaris*, Wall. MSS.

Sikkim, at elevations of 2,000 to 6,000 feet; in flower from October to December; Pantling, No. 19. Westward to Nepal and Dehra Dun; Wallich, Gamble. Khasia Hills, at 4,000 feet.

The flowers are pale brown, the lip having blackish-brown markings and hairs; the column is of a warmer tint than the rest of the flower. The inflorescence is

pseudo-proliferous, one flower appearing at a time and being accompanied by an axillary bud which ultimately developes into a second flower.

PLATE 187.—*Cœlogyne ovalis*, Lindl. A plant; Fig. 1 floral bract, *of natural size;* 2 lip, 3 upper part of column with the anther, 4 empty anther, 5 pollinia; *all enlarged.*

8. CŒLOGYNE ELATA, Lindl. in Wall. Cat., 1959.

Pseudo-bulbs oblong-cylindric, polished, sheathed at the base, 3 to 5 in. long and 1 to 2 in. in diam., rising at distances of about 2 in. from a very stout sheathed rhizome. *Leaves* in pairs, thinly coriaceous, narrowly elliptic-oblong, acute, narrowed at the base to the long petiole; length of blade 7 to 14 in., breadth 1·5 to 2·75 in., of petiole 1·25 to 3 in. Pednncle from the apex of the adult pseudo-bulb between the leaves and rather shorter than them, naked below, bearing many short imbricate sheaths just under the raceme. *Raceme* 4 to 6 in. long, distichous, laxly many-flowered. *Flowers* 1·25 in. across; *floral bract* sub-rhomboid, acute, conduplicate, slightly-longer than the stalked ovary, caducous. *Sepals* sub-equal, oblong, sub-acute, spreading. *Petals* as long as the sepals but much narrower, sub-acute. *Lip* elongate, the lower part oblong and with narrow entire side lobes, separated from the sub-orbicular anterior lobe by an erose-edged sinus; anterior lobe irregularly erose, undulate, obtuse; the disc with two erose-crenulate lamellæ from the base to near the apex. *Column* winged in its upper half, the wing erose at the apex; *pollinia* dimidiately ovate. *Capsule* clavate, 1·5 in. long. Lindl., Gen. and Spec. Orch., 40; in Wall. Pl. As. Rar. III, 12, t. 218; in Bot. Reg., 1839, Misc. 92; Fol. Orchid. 9; Bot. Mag., t. 5001; Walp. Ann. VI, 230; Hook. fil. Fl. Br. Ind. V, 838. *Cœlogyne* sp. Griff. Ic. Pl. Asiat., t. 290.

Sikkim, at elevations of 4,000 to 6,000 feet; Lister, Gammie; in flower during May and June; Pantling, No. 123. Westward along the range to Nepal and Gharwal. Bhutan and upper Burma; Griffith.

The flowers are in colour ochraceous white, the lip having a broad spot of yellow and pink on the lamellæ on its anterior lobe, the lower part of the lamellæ being yellow; the column is white and the ovary pinkish-brown. The flowers have rather an unpleasant smell.

PLATE 188.—*Cœlogyne elata*, Lindl. A raceme and part of its peduncle, fig. 5 bract; *of natural size.* Outline of a plant; *reduced in size.* Fig. 1 a flower, 2 apex of ovary, column and lip in profile, 3 lip, 4 apex of ovary and column with anther *in situ*, 6 empty anther, 7 pollinia; *all enlarged.*

9. CŒLOGYNE LONGIPES, Lindl. Fol. Orch., 10.

Pseudo-bulbs slender, cylindric, tapering to each end, slightly sheathed at the base, 2·5 to 4 in. long and ·4 or ·5 in. in diam., obliquely attached at distances of 2 to 3 inches to a rather slender rhizome clothed with imbricate sheaths. *Leaves* narrowly elliptic, acute, narrowed to the petiole, 3 to 6 in. long and 1 to 1·5 in. broad. Peduncle erect, terminal, as long as or longer than the leaves, naked below, but clothed near the flowers with numerous small distichous imbricate *bracts*. *Raceme* about 2 in. long, its rachis slightly sinuous. *Flowers* ·75 to 1 in. across; *floral bract* leathery, oblong, acute, convolute, almost as long as the flower, caducous. *Sepals* sub-equal, spreading, oblong-lanceolate, sub-acute. *Petals* linear, twisted, reflexed. *Lip* oblong,

concave at the base and with narrow entire lateral lobes; the anterior lobe sub-quadrate, emarginate, its edges undulate-crenulate; upper surface with two slender lamellæ proceeding from the base and becoming much enlarged in the terminal lobe. *Column* straight, very slightly winged, broader opposite the stigma than at the minutely crenulate apex. *Pollinia* obovoid, the caudicle-like membrane very small. *Capsule* ellipsoid, obtusely angled, ·75 to 1 in. long. Walp. Ann. VI. 230; Hook. fil. Fl. Br. Ind. V, 839.

Sikkim, at elevations of 6,000 to 7,000 feet; in flower during May and June; Pantling, No. 128. Naga Hills, at Kohima, elevation 4,500 feet; Prain. Khasia Hills, at elevations of 4,000 to 5,000 feet; Griffith, Hook. fil.

The flowers are pale greenish flushed with yellow, the side lobes and lamellæ of the lip having reddish markings. The inflorescence of this species is proliferous, exactly in the same manner as that of *C. flavida*, Wall.

PLATE 189.—*Cœlogyne longipes*, Lindl. A plant; fig. 3 floral bract, *of natural size*. Fig. 1 a flower, 2 lip, 4 column with anther *in situ*, 5 empty anther, 6 pollinia; 7 two pollinia in profile; *all enlarged*.

10. CŒLOGYNE PROLIFERA, Lindl. in Wall. Cat., 1956.

Pseudo-bulbs narrowly ovoid, compressed, shrunken at flowering time, with short sheaths at the base, 1·25 in. long, rising at distances of 1·5 to 2 in. from a rhizome ·25 in. thick, clothed with imbricate scale-like sheaths. *Leaves* narrowly elliptic, acute, tapering to the shortly petiolate base, sometimes sessile; length 2·5 to 4 in., breadth ·5 to ·75 in. Peduncle terminal, shorter than the leaves, naked below, but bearing numerous imbricate distichous sheaths under the flowers. *Raceme* 2 in. long, lax, 3- to 6-flowered, the rachis zig-zagged. *Flowers* ·8 in. across; *floral bract* oblong, acute, convolute, longer than the stalked ovary, caducous. *Sepals* sub-equal, broadly lanceolate, sub-acute, erecto-patent. *Petals* as long as the sepals, filiform, reflexed. *Lip* oblong; the lateral lobes erect, broadly sub-triangular, obtuse; the terminal lobe sub-quadrate, with boldly undulate margins and with two converging lamellæ on its upper surface; the apex broad, minutely apiculate. *Column* long, rather straight, very slightly winged towards the apex. *Pollinia* broadly oblong. *Capsule* pyriform, obtusely angled, ·75 to 1 in. long. Lindl. Gen. and Spec. Orch., 40; Fol. Orchid, 10; Walp. Ann. VI, 230; Hook. fil. Fl. Br. Ind. V, 838.

Sikkim, in the Lachen Valley at elevations of about 6,000 or 7,000 feet; in flower during June; Pantling, No. 366. Nepal; Wallich. Khasia Hills, at elevations of 3,000 to 5,000 feet; Simons, Oldham, Mann.

The sepals and petals of the Sikkim plant are of a pale yellowish-brown, the tips of the side lobes and the whole of the anterior lobe being orange-brown and the column greenish-yellow. In Sikkim we have found this only at comparatively high elevations (6,000 to 7,000 feet). But, in the Khasia Hills, the species occurs at much lower elevations (3,000 to 4,000 feet) and in a much larger form, the blade of the leaf attaining a length of 6 or 7 in. and the peduncle and its raceme measuring as much as 10 inches.

PLATE 190.—*Cœlogyne prolifera*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 stalked ovary, column and lip, seen in profile, 3 lip, 4 column and anther, 5 empty anther, 6 pollinia; *all enlarged*.

11. Cœlogyne flavida, Wall. MSS. ex Hook. fil. Fl. Br. Ind. V, 839.

Pseudo-bulbs elongated-ovoid, shrunken when in flower, sheathed at the base, 1·5 to 2 in. long, standing from 1 to 1·5 in. apart on a scaly rhizome ·25 in. thick. *Leaves* in pairs, narrowly elliptic-oblong, acute, contracted at the base into the petiole; length 4 to 7 in. long, breadth ·75 to 1·25 in. Peduncle terminal, naked below, but with many small imbricate scaly sheaths just under the flowers, often proliferous from the production of flowers several years in succession on the annually lengthening axis. *Raceme* 1·5 to 2·5 in. long, laxly few-flowered. *Flowers* ·5 in. across; *floral bract* large, scarious, broadly ovate, acute, convolute, longer than the slender stalked ovary. *Sepals* sub-equal, spreading, ovate, bluntly acuminate. *Petals* linear, spreading, as long as the sepals, obtuse. *Lip* oblong, 3-lobed, the basal half concave; the side lobes small, oblong, obtuse; the terminal lobe decurved, cuneately obcordate, separated from the lateral lobes by two broad sinuses, its disc faintly 2-ridged. *Column* long, straight, very slightly winged near the apex; *pollinia* dimidiately clavate. Hook. fil. ex Lindl. Fol. Orchid, 10; Walp. Ann. V, 223; Hook. fil. Fl. Br. Ind. V, 839; in Ann. Bot. Gard. Calc., V, 28, t. 42.

Sikkim, ascending to elevations of 5,000 feet; very common, in flower from May to July and even later; Pantling, No. 29. Naga Hills; at Kohima, Prain. Khasia Hills; G. Mann.

The flowers are of a pretty uniform pale yellow.

Plate 191.—*Cœlogyne flavida*, Wall. A plant; 4 a floral bract; *of natural size.* Fig. 1 a flower, 2 stalked ovary, column and lip in profile, 3 column and anther, 5 transverse section of lip through the side lobes, 6 empty anther, 7 pollinia; *all enlarged.*

12. Cœlogyne uniflora, Lindl. in Wall. Cat., 1966.

Pseudo-bulbs coespitose, broadly ovoid, mammillate, with some loose fibrous sheaths at the base, ·6 to 1·2 in. long. *Leaves* in pairs, narrowly oblong, acuminate, slightly narrowed at the base, sessile, 2 to 3·5 in. long and ·35 to ·45 in. broad. *Flower* solitary on a short peduncle from the base of the pseudo-bulb and usually shorter than it; the peduncle up to its junction with the ovary sheathed in lanceolate acuminate imbricate bracts. *Sepals* oblong-lanceolate, sub-acute, spreading. *Petals* broadly lanceolate, sub-acute, shorter than the sepals. *Lip* oblong, with a very short claw at the base; the side lobes erect, narrow, with their acute apices pointing forwards, the isthmus between the lateral and side lobes with undulate edges; the anterior lobe ovate, blunt, entire, the disc between the lamellæ with two slight ridges. *Column* winged, with two broad, erose, marginal lobes below the stigma, the apex above the anther with a central broad shallow lobe and two teeth at each end of it. *Pollinia* broadly oblong, oblique. *Capsule* ellipsoid, winged, ·6 in. long. Lindl., Gen. and Spec. Orch., 42; Hook. fil. Fl. Br. Ind., 842; in Ann. Bot. Gard., Calc., Vol. V, 29, t. 43. *Panisea uniflora*, Lindl. Fol. Orch., 2; Walp. Ann. VI, 240. *Epidendrum*, Griff. Ic. Pl. Asiat., t. 313, fig. 1.

Sikkim, at elevations from 500 to 4,000 feet; in flower during April and May; Pantling, No. 71. Nepal; Wallich. Khasia Hills; Griffith. Tenasserim; Parish.

The sepals and petals are pale ochraceous, and the lip is of a pale brown with four elongated spots of dark brown, the column being white. Lindley, after first describing this as a *Cœlogyne*, finally regarded it as a *Panisea*. His earlier opinion appears to us to be the correct one; for the flowers of this in no way differ from those of a typical *Cœlogyne;* whereas the curious sigmoidly bent narrow claw at the base of the lip, so characteristic of *Panisea*, is here quite unrepresented. The lip of this has moreover conspicuous sharp side lobes, whereas that of *Panisea* has no lobes whatever and no lamellæ.

Plate 192.—*Cœlogyne uniflora*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 peduncle with ts bracts, ovary, column and lip, 3 lip, 4 column with auther *in situ*, 5 pollinia; *all enlarged*.

13. Cœlogyne Hookeriana, Lindl. Fol. Orchid., 14.

Pseudo-bulbs coespitose, oval, with a few lax sheaths, smooth, not mottled, ·75 to 1 in. long. *Leaf* solitary, proceeding from the base of the adult pseudo-bulb, narrowly elliptic, acute, tapering to the petiole; the blade 2 to 2·5 in. long and ·5 to ·8 in. broad; petiole ·75 to 1 25 in. long, enclosed in tubular imbricate sheaths. Peduncle enveloped in the same sheaths as the base of the undeveloped leaf and longer than the latter, (often several times longer,) bearing a solitary white flower 2 in. across; *floral bract* about as long as the stalked ovary, broadly obovate-elliptic, very obtuse, convolute, persistent. *Sepals* spreading, sub-equal in length, elliptic-oblong, blunt, the dorsal narrower than the lateral pair. *Petals* spreading, as long as the sepals, oblanceolate, obtuse. *Lip* sub-reniform, cordate at the base, broad and entire in its posterior half, narrowed, lobulate and minutely erose in its anterior, the apex retuse, the disc with five to seven slender ciliate ridges from the base nearly to the apex. *Column* long, curved, broadly winged in its upper half, the wings widening to the truncate erose apex. *Pollinia* obliquely elliptic. Bot. Mag., t. 6388; Hook. fil. Fl. Br. Ind. V, 842.

Sikkim, at elevations from 7,000 to 11,000 feet; in flower during May and June; Thomson, Watt, Gammie, Gamble; Pantling, No. 313. Kumaon; Collett, No. 160.

In the Sikkim plant the sepals and petals are white flushed with violet, the lip is also white with a large spot of yellow with dull reddish-mottlings. The sepals are, however, figured in the Botanical Magazine (t. 6388) as pale violet tipped with dark violet. In this, as also in all the members of this section (except *C. Hookeriana*), the leaves are deciduous and are absent at flowering time.

Plate 193.—*Cœlogyne Hookeriana*, Lindl. A plant; *of natural size*. Fig. 1 lip flattened out, 2 column and anther, 3 a floral bract, 4 anther, 5 pollinia; *all enlarged*.

14. Cœlogyne humilis, Lindl. Coll. Bot. 37.

Pseudo-bulbs coespitose, narrowly ovoid, tapering to the apex, partly enveloped by fibrous sheaths; length 1·25 to 1·75 in. *Leaves* membranous, elliptic, acute, tapering to the base, sessile; length 3 to 4 in., breadth 1·15 to 1·4 in. Peduncle from the base of the pseudo-bulb and about the same length, enveloped to the apex in tubular pale sheaths with pink striae, 1- rarely 2-flowered. *Flowers* 2 to 2·5 in. in diam., white; *bract* obovoid-elliptic, obtuse, convolute, pale purple, longer than the stalked ovary, persistent. *Sepals* sub-equal, spreading, oblong, acute; the *petals* narrower, obtuse.

Lip shortly clawed, sub-orbicular, without side lobes, concave in the lower part but expanding into a wide mouth with emarginate apex; the edges entire in the posterior sharply and somewhat irregularly dentate in the anterior half, the upper surface with numerous fringed lamellæ. *Column* very long, the apex expanded into a broad hood with a truncate erose apex; *pollinia* elliptic. Lindl. Gen. and Spec. Orch., 43; in Wall. Cat., 1963 (*in part*); Fol. Orch., 16; Bot. Mag., t. 5674; Hook. fil. Fl. Br. Ind. V, 810. *Pleione humilis*, Don Prod. Fl. Nep., 37; Paxt. Fl. Gard., t. 51. *Epidendrum humile*, Sm. Exot. Bot., t. 98. *Cymbidium humile*, Smith in Rees' Cyclop.

Sikkim, at elevations of 7,000 to 8,500 feet; in flower during February and March; Pantling, No. 64. Distributed westward to Nepal.

The lip is speckled with purple towards the edges (on the upper surface), the disc being yellow with brown spots, and the lamellæ being brown. In some specimens the brown on the lip is supplanted by purple or crimson. The column is spockled in front with purple. All other parts of the flower are white. The lip is sometimes adnate to the sides of the column for one quarter of the length of the latter; in other specimens it adheres to the column by its base only. To the European residents of Darjeeling the plant is known as the "Himalayan Crocus."

PLATE 194.—*Cœlogyne humilis*, Lindl. A plant; Fig. 1 lip flattened out, 2 a bract flattened out; *of natural size*; 3 column with anther *in situ*, 4 anther, 5 pollinia; *all enlarged*.

15. CŒLOGYNE MACULATA, Lindl., Gen. and Spec. Orch. 43.

Pseudo-bulbs as in *C. præcox*, but rather smaller, sometimes constricted at the middle, enclosed in a net-work of fibres (old bracts). *Leaves* two, narrowly elliptic-oblong, acute, narrowed to the petiole, their bases sheathed with bracts having nodular inflations; length 4·5 to 8 in., breadth 1 to 1·75 in. *Flowers* 2 to 3 in. across, rising singly from the base of the pseudo-bulb by a very short peduncle enveloped in a large spathaceous *flower bract* with broad emarginate apex, convolute, longer than ovary. *Sepals* sub-equal, spreading, oblong, lanceolate, sub-acute. *Petals* about equal in length to, but narrower than, the sepals, oblanceolate-oblong, spreading. *Lip* broadly elliptic, 3-lobed, the basal part convolute round the column; the lateral lobes narrow, entire; the terminal lobe broader than long, its edges sub-entire, its apex broad and emarginate; the upper surface with five to seven pectinate lines disappearing in the disc between the side lobes. *Column* long, slightly curved; the apex winged, irregularly erose. *Anther* with a small bilobed lip. *Pollinia* elliptic. *Capsule* ellipsoid, ·8 in. long, its peduncle elongating after flowering. Lindl. in Wall. Pl. As. Rarior. I, 45, t. 53; Fol. Orchid., 15; Bot. Mag., t. 4691; Fl. des Serres, t. 1470; Griff. Notul. III, 281; Hook. fil. Fl. Br. Ind. V, 841. *C. candida*, Lindl. in Wall. Cat., 1964. *Pleione maculata*, Lindl. in Paxt. Fl. Gard., t. 39, fig. 1. *P. aiphylla*, Lindl. in Paxt. Fl. Gard. under t. 51; Fol. Orch., 15; Walp. Ann. VI, 234. *Cœlogyne*, Griff. Itin. Notes, 44, 684. *Gomphostylis candida*, Wall. MSS.

Sikkim, at elevations of from 1,600 to 3,000 feet; in flower during October and November; Pantling, No. 21. Nepal; Wallich. Bhutan; Clarke. Khasia Hills, at elevations of from 4,000 to 5,000 feet.

The sepals and petals are white with occasional pink lines. The lip is much marked with purple and yellow and the column is green. The flowers are fragrant. This species is usually leafless at flowering time.

PLATE 195.—*Cœlogyne maculata*, Lindl. A plant; *of natural size.* Fig. 1 lip, 2 column with anther *in situ*, 3 bract, 4 anther, 5 pollinia; *all enlarged.*

16. CŒLOGYNE PRÆCOX, Lindl. Coll. Bot. 37; in Wall. Cat. 1965.

Pseudo-bulbs coespitose, varying in shape at different stages of growth from ampullate to turbinate, finally often shortly cylindric, usually umbonate in all stages, the surface mottled with brown or purple and imperfectly sheathed by loose brown fibres. *Leaves* in pairs, membranous, elliptic or elliptic-oblong, many-nerved, occasionally somewhat oblanceolate, sub-acute, narrowed at the base to the petiole, 4 to 8 in. long and 1·75 to 2·5 in. broad, petiole 1 to 2 in. Peduncle from the base of and about as long as the mature pseudo-bulb, its lower half enveloped in tight tubular mottled sheaths, its apex 1- or 2-flowered. *Flowers* large, rose-coloured, 3 or 4 in. across; *floral bract* obovoid, very obtuse, convolute, as long as the stalked ovary or longer. *Sepals* sub-equal, spreading, oblanceolate or lanceolate. *Petals* as long as but narrower than the sepals, spreading. *Lip* ovate-orbicular, without side lobes, the basal part convolute round the column, the anterior part concave, having an open wide repand mouth with deeply and irregular lobulate-dentate edges, the apex slightly bifid, the disc with five laciniate lamellæ. *Column* very long, with a short sac at the base, the apex expanded into a wide undulate irregularly lobulate hood. *Pollinia* clavate. Lindl. Fol. Orchid, 16; Bot. Mag., t. 4496; Paxt. Mag. XIV. t. 7; Hook., fil. Fl. Br. Ind. V, 840. *C. Wallichiana*, Lindl. Gen. and Spec. Orch., 43; in Wall. Pl. As. Rarior. I, 46, t. 54; Bot. Reg. XXIV, Misc. 85; Paxt. Mag. VI, t. 25; Gartenflora, t. 283; Jennings' Orchids, t. 47; Griff. Notul. III, 402. *Pleione præcox*, Don Prod. Fl. Nep. 37. *P. Wallichii*, Lindl. in Paxt. Fl. Gard. sub. t. 51; *P. Birmanica*, Reichb. fil. in Gard. Chron., 1882, II, 840. *Epidendrum præcox*, Smith Exot. Flora, t. 97.

Sikkim, at elevations of 6,000 to 8,000 feet, very common; Pantling, No. 96. Westward to Gharwal and eastward and southward to Bhutan, the Khasia Hills and Burma. Except the lip, the whole flower is of a brilliant rose colour, often tinged with violet.

The lip has a patch of white on the disc, with a smaller arc of yellow on the lamellæ. Occasionally a specimen occurs with its flowers pure white. The much narrowed base of the lip coheres with the sides of the column to form a small saccate nectary.

PLATE 196.—*Cœlogyne præcox*, Lindl. A plant; 3 a bract flattened out; *of natural size.* fig. 1, lip flattened out, 2 column with auther *in situ*; 4 anther, 5 pollinia; *all enlarged.*

22. Panisea, Lindl.

Epiphytal; *pseudo-bulbs* small, ovoid, coespitose, 2-leaved. *Leaves* membranous, plicate. *Scape* from the base of the pseudo-bulb; the *raceme* lax and few-flowered, flowers rather small. *Sepals* and *petals* membranous, sub-equal, narrow, sub-spreading, the lateral pair slightly saccate at the base. *Lip* membranous, as long as the sepals, adnate to the base of the column, entire, the disc not lamellate; the claw long, sigmoid, bituberculate. *Column* long, slender below, but dilating upwards into an erose wing, foot none. *Anther* sub-terminal, opercular, 2-celled. *Pollinia* 4, broadly oblong, the upper three-fourths oblique, the lower straight and cohering.

A genus which forms a connecting link between *Cœlogyne* and *Otochilus*, but differs from both in the curious sigmoid flexure of the base of the lip. The lip, like that of *Otochilus*, has no lamellæ, whereas in *Cœlogyne* a lamellated disc is the rule. There are two species—the following and another named ***P. apiculata.***

PANISEA PARVIFLORA, Lindl. Fol. Orchid. p. 1.

Pseudo-bulbs narrowly ovoid, translucent, ·6 to 1 in. long. *Leaves* narrowly elliptic-lanceolate, acute, tapering to the base, sub-sessile, 2 to 3 in. long. *Scape* filiform, decurved, about as long as the leaves, the base with membranous sheaths. *Flowers* ·5 in. across; *floral bract* lanceolate, large, shorter than the stalked ovary, membranous. *Sepals* keeled, the dorsal linear-oblong; the lateral pair falcate, acute, gibbous at the base. *Petals* oblong, blunt. *Lip* above the sigmoid claw narrowly lanceolate, sub-acute, 3-nerved. *Capsule* elliptic, turgid. Hook. fil. Fl. Br. Ind. V, 783; in Ann. Roy. Bot. Gard. Calc. V, 19, t. 29. *P. reflexa*, Lindl. Fol. Orch. 1. *Cœlogyne parviflora*, Lindl. Gen. and Spec. Orch., 44. *Dendrobium demissum*, Don Prod., 34. *Androgyne* sp., Griff. Notul. III, 279.

Sikkim, at elevations of about 6,000 feet; Clarke, King, Pantling, No. 301; in flower about October. Nepal; Wallich. Khasia Hills; Griffith.

The flowers are white with brown streaks, the column being entirely brown.

PLATE 197.—*Panisea parviflora*, Lindl. A plant; *of natural size.* Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip seen from the side, 3 lip, 4 column, 5 anther, 6 pollinia; *all enlarged.*

23. Otochilus, Lindl.

Epiphytal. *Stems* pendulous, jointed, branched, formed of superposed elongate pseudo-bulb-like internodes, bearing roots at the nodes. *Leaves* in pairs from the apex of the terminal node, linear, elliptic or lanceolate, membranous, plicate. *Raceme* pendulous, from the pseudo-bulb just below the leaves, many-flowered, the flowers distichous, the peduncle sheathed. *Flowers* small, white; *floral bract* scarious. *Sepals* and *petals* sub-equal, spreading, free, narrow. *Lip* with a short two-horned sac at the base and a long narrow acute entire concave deflexed terminal lobe. *Column* very long, slender, clavate, erect, with no foot. *Anther-cells* distinct. *Pollinia* 4, ovoid or cuneate, flattened, attached to a single bilobed membrane. Species three; all Indian.

Flowers 1·1 in. long from apex of dorsal sepal to apex of lip.
Leaves narrowly elliptic . . . . . *1. O. porrecta.*
Flowers ·5 to ·75 in. long from apex of dorsal sepal to apex of lip.
Leaves linear-oblong, sepals and petals obtuse . . . . . *2. O. fusca.*
Leaves elliptic-oblong, sepals and petals acute . . . . . *3. O. alba.*

1. OTOCHILUS PORRECTA, Lindl. in Wall. Cat., 1968; Gen. and Spec. Orch., 36.

Internodes of the stem cylindric, 2 to 4 in. long, often sheathed. *Leaves* narrowly elliptic, acuminate, narrowed at the base to the short petiole, 5 to 10 in. long, and 1·5 to 2·5 in. broad. *Raceme* shorter than the leaves, very laxly-flowered, its peduncle about 1·5 in. long. *Flowers* 1·1 in. long; the *floral bract* broad, acute, caducous, the pedicelled ovary long and slender. *Sepals* sub-equal, narrowly oblong, the lateral pair sub-falcate. *Petals* as long as the sepals, linear, acute, spreading. *Lip* shorter

and broader than either sepals or petals, the saccate base with acute side lobes, the anterior lobe deflexed from its base, oblong, acute. *Column* very long and slender, winged and thickened towards the apex, the lip of the anther shortly pointed. *Pollinia* ovoid-globular. Hook. fil. Fl. Br. Ind. V, 844. *O. latifolia*, Griff. Notul. III, 279; Ic. Plant. Asiat., t. 289. *Cœlogyne porrecta*, Reichb. fil. in Walp. Ann. VI, 236. *Tetrapeltis fragrans*, Wall. MSS.

Sikkim, at elevations of from 4,000 to 6,000 feet, very abundant; in flower from October to January; Pantling, No. 26. Distributed westwards to Nepal and eastwards and southwards to the Naga, Khasia and Burmese hill ranges.

In Sikkim this species forms large masses, often breaking down thick branches of trees by their weight. The flowers are white, there being, however, a patch of brown on the sac of the lip and the column being altogether brown, as is the rachis.

PLATE 198.—*Otochilus porrecta*, Lindl. A plant; *of natural size*. Fig. 1 a flower, front view, 2 ovary, column, anther and lip, seen from the side, 3 bract, 4 column with anther *in situ*, 5 anther, lower surface, 6 pollinia; *all enlarged*, 7 capsule; *of natural size*.

2. OTOCHILUS FUSCA, Lindl. in Wall. Cat., 1969; Gen. and Spec. Orch., 35.

Pendulous; internodes of the stem cylindric or fusiform, 1 to 3 in. long, somewhat shrunken at flowering time, often clothed with fibrous sheaths. *Leaves* shortly petioled, linear-oblong, acuminate, slightly narrowed to the base, 4 to 6 in. long and ·4 to ·5 in. broad. *Racemes* about as long as the leaves while in flower but much longer when in fruit; the peduncle only about 1 in. long, enclosed in imbricated sheaths. *Flowers* ·6 in. long; the *floral bract* scarious, narrow, oblong, subtruncate, with incurved edges, longer than the stalked ovary. *Sepals* sub-equal, free, narrowly oblong, obtuse, spreading. *Petals* slightly smaller than the sepals, oblanceolate, spreading. *Lip* with a short saccate bi-cornute base and a long oblong acute deflexed concave terminal lobe rather shorter than the sepals. *Column* short and with no foot, slightly winged towards the apex. *Anther* with a pointed lip. *Pollinia* cuneate. *Capsule* elliptic, apiculate, about ·35 in. long. Bot. Mag., t. 3921; Hook. fil. Fl. Br. Ind. V, 844. *O. lancifolia*, Griff. Notul. III, 278; Ic. Pl. Asiat., t. 289. *Cœlogyne fusca*, Reichb. fil. in Walp. Ann. VI, 236. *Broughtonia fusca*, Wall. MSS.

Sikkim, at elevations of 3,000 to 6,000 feet; very common; in flower during December. Pantling, No. 61. Nepal, Assam, Khasia Hills, Manipur.

The rachis, column, ovary and fruit are brown in colour; the saccate base of the lip brown with a tinge of pink; while the sepals, petals and anterior lobe of the lip are pure white. As in *O. porrecta* and *O. alba*, there is a fibrous core running through the superposed pseudo-bulbs which compose the stem.

PLATE 199.—*Otochilus fusca*, Lindl. A plant; *of natural size*. Fig. 1 front view of a flower, 2 top of column with the anther *in situ*, 3 part of rachis, stalked ovary, column, anther and lip, seen from the side, 4 anther, lower surface, 5 pollinia, 6 transverse section of a capsule; *all enlarged*.

3. OTOCHILUS ALBA, Lindl. in Wall. Cat., 1967; Gen. and Spec. Orch., 35.

Internodes of the stem sub-cylindric, rather slender, 1·5 to 2·5 in. long. *Leaves* elliptic-oblong, often very narrow, acuminate, tapering at the base into the distinct narrow petiole; length 2·5 to 7 in., breadth ·5 to 1 in., petiole ·5 to 1·25 in.

Raceme shorter than the leaves, laxly-flowered, its peduncle about 1·25 in. long, enveloped in large sheaths. *Flowers* ·5 to ·6 in. across (vertically); the *floral bract* large, ovate-lanceolate, longer than the stalked ovary, caducous. *Sepals* oblong-lanceolate, acute, the dorsal rather smaller than the lateral pair, the *petals* narrower. *Lip* somewhat longer than the sepals; the saccate base with rather broad side lobes, the anterior lobe oblong, apiculate, deflexed from the base. *Column* very long and slender, winged and thickened towards the apex, bent downwards at its base. *Pollinia* sub-globose. *Capsule* elliptic, tapering to both ends, ·5 in. long. Hook. fil. Fl. Br. Ind. V, 843. *Cœlogyne alba*, Reichb. fil. in Walp. Ann. VI, 236. *Broughtonia pendula*, Wall. MSS.

Sikkim, at elevations of from 3,000 to 5,000 feet; common; in flower during June. Pantling No. 35. Extending to Nepal on the west and to the Khasia and Naga Hills towards the east and south. The colour of the flowers is white.

PLATE 200.—*Otochilus alba*, Lindl. Part of a plant; *of natural size*. Fig. 1 front view of a flower, 2 lip, 3 stalked ovary, column and lip with the anther *in situ*, showing also the bases of the cut-off petals, 4 upper part of column showing anther and stigma, 5 lower surface of anther, showing the pollinia, 6 pollinia; *all enlarged*.

24. Pholidota, Lindl.

Epiphytal with jointed often branching stems with internodes like pseudo-bulbs, or with tufted pseudo-bulbs. *Leaves* usually in pairs (solitary in *P. imbricata*), membranous, many-nerved. *Racemes* on ebracteate peduncles, terminal or from the base of a pseudo-bulb (from below the leaves in two species) usually drooping and distichous; *floral bract* large and persistent. *Flowers* small, sub-globose, expanding from above downwards. *Sepals* concave, the lip usually without side lobes, more or less cymbiform and saccate. *Petals* narrower than the sepals. *Column* short, the apex shortly hooded or winged; anther cells more or less sub-globose. *Pollinia* 4, sub-globose or clavate, cohering by pairs to one or two membranes. Species about twenty; Indian, Malayan or Chinese.

Leaf solitary . . . . . 1. *P. imbricata.*

Leaves in pairs.

Rhizome fleshy, not jointed, more or less covered with fibrous sheaths and emitting pseudo-bulbs at intervals.

Rhizome short, raceme 8 to 10 in. long . . . . . 2. *P. rubra.*

Rhizome 1 or 2 feet long, racemes 1 to 1·5 in. long . . 3. *P. protracta.*

Stems jointed, the internodes pseudo-bulb-like; racemes terminal from between the leaves, only one from each branch.

Leaves narrowly elliptic.

Bracts rhomboid-ovate, acute, deciduous . . . . . 4. *P. articulata.*

Bracts oblong or sub-orbicular, obtuse, small, deciduous . 4. *P. articulata*, var. *Griffithii.*

Leaves narrowly oblong.

Bracts fan-shaped, with broad truncate apices, persistent . 5. *P. recurva.*

1. PHOLIDOTA IMBRICATA, Lindl. in Hook. Fl. Exot., t. 138.

Pseudo-bulbs coespitose, cylindric, thickened at the base, 2 or 3 in. long and (at the middle) about ·6 or ·7 in. thick; or shorter and more ovoid, furrowed, usually partly

enveloped in large fibrous sheaths. *Leaf* solitary, elliptic-oblanceolate or lanceolate, acute, much tapered to the stout petiole; length 6 to 12 in., breadth 1·25 to 2·5 in., petiole 1·5 in. *Inflorescence* from the base of a pseudo-bulb, drooping, 8 or 10 in. long (longer in fruit); the peduncle slender, as long as or longer than the dense many-flowered raceme. *Flowers* distichous, ·25 in. long; *floral bract* large, convolute, sub-rotund, minutely apiculate, the edges irregularly infolded, many-nerved, longer than the slender stalked ovary, persistent. Dorsal *sepal* orbicular; the lateral pair connate at the base, cymbiform, with a winged keel. *Petals* oblong, sub-acute. *Lip* 3-lobed; the lateral lobes large, broad, rounded; the terminal lobe divided at the apex into two small oblong lobules separated by a broad sinus. *Column* broad and winged in its upper half; *pollinia* clavate, attached by pairs to two small membranes. *Capsule* ellipsoid, ·75 in. long. Lindl. in Wall. Cat, 1991; Gen. and Spec. Orch., 37; in Bot. Reg., t. 1213 and 1777; Lodd. Bot. Cab., t. 1934; Wight Ic. t. 907; Dalz. and Gibs. Bomb. Fl. 262; Hook. fil. Fl. Br. Ind. V, 845. *P. pallida*, Lindl. in Bot. Reg. XXI, sub t. 1777. *Cœlogyne imbricata* and *C. pallida*, Reichb. fil. in Walp. Ann. VI, 238. *Ptilocnema bracteatum*, Don Prodr. 33. *Cymbidium imbricatum*, Roxb. Fl. Ind. III, 460. *Ornithidium imbricatum*, Wall. MSS.

Sikkim, from the foot of the range to elevations of 5,000 feet; common; in flower from May to August; Pantling, No. 30. Westward to Kumaon and east-ward and southward to Bhutan, the Assam hill ranges, Chittagong, Burma, and the Andaman Islands. Also in the Deccan Peninsula and Ceylon, and in the Malayan Peninsula.

The flowers, ovaries and bracts are of an almost uniform pale brown colour.

PLATE 201.—*Pholidota imbricata*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 ovary, column and lip in profile, 3 bract, 4 lip, 5 petals, 6 front view of column, stigma and anther *in situ*, 7 an empty anther, 8 pollinia; *all enlarged*.

2. PHOLIDOTA RUBRA, Lindl., Gen. and Spec. Orch., 37.

Rhizome thick, covered with fibrous sheaths; pseudo-bulbs fusiform, furrowed, about 3 in. long, usually sheathed at the base, about ·75 in. in diam. at the middle. *Leaves* two, narrowly elliptic, acuminate, tapering to the sessile base, 4 to 10 in. long, and ·85 to 1·5 in. broad. *Raceme* from the base of a pseudo-bulb, almost sessile, 6 to 9 in. long, drooping. *Flowers* very numerous, distichous, not crowded, ·2 in. long, embraced while in bud by the bract. *Ovary* short, stalked, slender, only half as long as the cymbiform, acute, persistent bract. *Sepals* ovate, with broad bases and acute apices, spreading, the midrib thick. *Petals* linear, obtuse, spreading. *Lip* oblong; the lower part cymbiform and with two small rounded lateral lobes; the anterior lobe small, broadly ovate, acute, decurved; the disc 3- to 5-nerved, the nerves slender. *Column* broadly winged at the apex; *pollinia* clavate, attached in pairs to two small membranes. *Capsule* broadly elliptic, ·5 in. long. Wall. Pl. As. Rar. III, 21, t. 239; Hook. fil. Ic. Plant., t. 1879; Hook. fil. Fl. Br. Ind. V, 847. *P. undulata*, Lindl. in Bot. Reg. XIV, sub t. 1213 and XXVII, Misc. 6. *Cœlogyne rubra* and *C. undulata*, Reichb. fil. in Walp. Ann. VI, 238.

Sikkim, at elevations of from 3,000 to 6,000 feet; in flower during November and December; Pantling, No. 58. Khasia Hills, Griffith (Kew Distrib.) No. 5044, Clarke, Mann.

The sepals and petals are of a dull pale yellowish-green, the lip and column pinkish-brown.

PLATE 202.—*Pholidota rubra*, Lindl. A plant; *of natural size*. Fig. 1 a flower, front view, 2 part of rachis, bract, column and lip, 3 lip, 4 front view of column, stigma and anther *in situ*, 5 under surface of anther, 6 pollinia; *all enlarged*.

3. PHOLIDOTA PROTRACTA, Hook. fil. Ic. Plant. t. 1877.

Stem elongate, slender, clothed in numerous long scarious sheaths and sending off at intervals translucent fusiform pseudo-bulbs 1·5 to 2 in. long, often bracteate at the base; bearing at the apex two membranous narrowly elliptic leaves with acute apices, the bases narrowed to the short petioles, 3 to 5 in. long and ·75 to ·9 in. broad. *Racemes* several from the joints of the rhizome, shorter than the leaves, few-flowered, the peduncles short. *Flowers* nearly ·25 in. long; *bract* broadly ovate, acute, recurved, shorter than the stalked ovary. *Sepals* sub-equal, broadly ovate, blunt, very concave, connivent. *Petals* broadly elliptic, very obtuse, somewhat shorter than the sepals. *Lip* oblong, concave, gibbous near the base; the apex somewhat narrowed, corrugately trilobulate. *Column* rather broadly winged in its upper half. *Pollinia* cuneate, attached by pairs to a broad membrane. *Capsule* sub-globular, boldly ridged, ·3 in. long. Hook. fil. Fl. Br. Ind. V, 845.

Sikkim, at elevations of 5,000 to 7,500 feet; Griffith and others; in flower from October to December; Pantling, No. 55. Khasia Hills; Griffith (Kew Distrib.), No. 5042. Naga Hills; Prain, No. 27.

The flowers are green, but the lip has four small bright patches of dull yellow on its anterior lobe.

PLATE 203.—*Pholidota protracta*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, front view, 2 side view of recurved floral bract, stalked ovary and flower, 3 side view of apex of ovary, column and lip, 4 lip, 5 front view of column, stigma and anther *in situ*, 6 anther, 7 pollinia, 8 profile of a single pollinium; *all enlarged*.

4. PHOLIDOTA ARTICULATA, Lindl. in Wall. Cat., 1992; Gen. and Spec. Orch. 38.

Stem jointed, branching; the internodes terete, furrowed, 2 to 4 in. long, and about ·5 in. in diam., the nodes with a few short broad scarious sheaths. *Leaves* thickly membranous, many-nerved, narrowly oblong, tapering to each end; length 3 to 4·5 in., breadth 1 to 1·75 in. *Raceme* drooping, terminal on the young pseudo-bulbs, issuing between and about as long as the leaves, many- and densely-flowered, the young leaves sheathed at the base. *Flowers* ·3 in. long; *bract* about ·5 in. long, rhomboid-ovate, convolute, acute, deciduous when the flowers expand; stalk of ovary slender. Dorsal *sepal* sub-orbicular; the lateral pair ovate, keeled. *Petals* ovate-orbicular, blunt. *Lip* about as long as the sepals, broadly cymbiform, with a transversely oblong broad bilobulate middle lobe infolded at its base, the disc with five bold lamellæ. *Column* slightly winged towards the apex, the clinandrium irregularly toothed; the rostellum large, erect, acuminate. *Pollinia* sub-globular, attached to a cuneiform membrane. Lindl. in Bot. Reg. for 1839, Misc. 44; Hook. fil. Fl. Br. Ind. V, 844. *P. khasiana*, Reichb. fil. in

Walp. Ann. VI, 238; in Bonplandia IV, 329. *Cœlogyne articulata*, Reichb. fil. in Walp. Ann. VI, 238. *C. khasiana*, Reichb. fil. l. c., 238.

Sikkim, common from the foot of the range to an elevation of 4,000 feet; in flower from June to August; Pantling, No. 31. Westward to Kumaon, eastward to Bhutan. Also in the Khasia Hills and Upper Burma.

The flowers are white tinged with brownish pink and the floral bracts are pale brown.

Var. *Griffithii*, King and Pantling. Like the type in most respects, but smaller in all its parts, the internodes less furrowed and with narrower leaves; *flowers* only ·2 in. across; the floral bract and dorsal sepal suborbicular, blunt; *petals* elliptic-lanceolate; *sepals* green; *petals* pale green; *lip* brown. *Pholidota Griffithii*, Hook. fil. Ic. Plantar., t. 1881; Fl. Br. Ind. V, 845; Wall. Cat. No. 1992 (*in part*).

Sikkim, at elevations of 2,000 to 4,000 feet; in flower during July and August. Griffith, Hooker *filius;* Pantling, No. 32. Dehra Dun; Gamble. Khasia Hills, at 5,000 feet; Clarke, Mann.

PLATE 205.—*Pholidota articulata*, Lindl. A plant; *of natural size.* Fig. 1 flower, side view, 2 stalked ovary, column and lip in profile, 3 lip, 4 column and anther *in situ*, 6 anther, 7 pollinia, *all enlarged;* 5 bract, *of natural size.*

PLATE 204.—*Pholidota articulata*, Lindl. var. *Griffithii*, King and Pantling. A plant; *of natural size.* Fig. 1 a flower, 2 side view of stalked ovary, column and lip, 3 bracts opened out, 4 lip, 5 front view of column, stigma and anther *in situ*, 6 view of the inside of the anther, its lateral margins shrunken and reflexed, 7 pollinia; *all enlarged.*

5. PHOLIDOTA RECURVA, Lindl., Gen. and Spec. Orch., 37.

Stems thin, jointed, branching; the internodes yellowish, polished, angled when fresh (with the appearance of being winged when dry), 1·5 to 4 in. long and only ·3 in. in diam., the nodes with a few broad scarious sheaths. *Leaves* membranous, narrowly elliptic-oblong, acute, narrowed at the base into the short petiole, the young ones sheathed at the base; length 2·5 to 4·5 in., breadth ·6 to ·8 in. *Racems* terminal, from between and about as long as the leaves of a young pseudo-bulb, decurved, secund, with numerous crowded flowers; the peduncle short, slender. *Flowers* ·15 in. long; *bracts* fan-shaped, with truncate apices, imbricated, secund, as long as the stalked ovary, persistent. Dorsal *sepal* sub-orbicular, concave; the lateral pair broadly ovate, obtuse. *Petals* ovate-oblong, obtuse, spreading, as long as the sepals. *Lip* broadly cymbiform, with two auricle-like terminal lobes, and on the upper surface five short cylindric ridges. *Column* broad, with short wings near the apex; the rostellum short, transverse. *Pollinia* elliptic-clavate, attached in pairs to two small membranes. *Capsules* double-fusiform, narrow, ·5 in. long. Hook. fil. Ic. Plantar., t. 1878; Fl. Br. Ind. V, 845. *Cœlogyne recurva*, Reichb. fil. in Walp. Ann. VI, 238.

Sikkim, at elevations of from 2,000 to 4,000 feet; in flower during August and September; Pantling, No. 93. Distributed westward to Nepal and eastward to Bhutan.

The flowers are of a uniform pale brown, and the pseudo-bulbs of a yellowish-green passing into straw colour. The bracts persist on the racemes on the side opposite to the flowers, being quite as secund as the flowers.

PLATE 206.—*Pholidota recurva*, Lindl. A plant; *of natural size*. Fig. 1 front view of a flower, 2 lip, showing the lamellæ on the disc and the apical auricles, 3 side view of bract, stalked ovary, column and lip, 4 front view of column, stigma and anther, 5 under surface of anther, 6 pollinia; *all enlarged*.

Tribe III.—VANDEAE.

Pollinia 2, 4, or rarely 8, attached singly or in pairs or in fours by a caudicle (rarely by two caudicles) to a viscid gland derived from the stigma (in a few doubtfully from the stigma).

GROUP I.—Anther terminal.

Gland of pollinia doubtfully stigmatic—

Pollinia attached to a single caudicle—

Pollinia 4 (2 and deeply bifid in *Acrochœne*), cohering to a single caudicle expanding at its base into a gland doubtfully derived from the stigma.

Terrestrial and with a short pseudo-bulb, petals entire, column with no foot.

Spur of lip long, narrowly infundibuliform at the mouth, otherwise cylindric, curved . . . . . *25. Tipularia.*

Epiphytal; the pseudo-bulbs on a creeping rhizome, each with a single leaf; lip jointed to the long foot of the column, spur none, petals fimbriate.

Lip panduriform, 2-horned at the base and with two erect lamellæ; petals and sepals inserted on the long foot of the column at a distance from each other . . . . . *26. Monomeria.*

Lip 3-lobed, the basal lobes erect and broad, the apical lobe narrower, acute, deflexed; petals attached to the column and the lateral sepals to its foot, but close together; pollinia 2, bifid . . . . . *27. Acrochœne.*

Pollinia 8, clavate, cohering by fours to a viscid caudicle, or sessile on the gland.

Epiphytal and without pseudo-bulbs.

Stems thick, compressed, fleshy, unbranched, leafy; flowers small and in dense heads . . . . . *28. Agrostophyllum.*

Stems terete, much and dichotomously branched; flowers solitary or two in a raceme . . . . . *29. Ritaia.*

Pollinia attached to two caudicles—

Pollinia 4, attached in pairs to two free caudicles; gland single, double or absent; epiphytal . . . . . *30. Ione.*

Gland of pollinia truly stigmatic—

Pollinia 8—

Pollinia cuneate or oblong, united to a large or small gland; sepals cohering into a tube; racemes secund . . . . . *31. Cryptochilus.*

Pollinia clavate; sepals and petals not cohering into a tube; flowers in pedunculate interfoliar racemes; the base of the lip connate into a tube with the column, usually spurred; terrestrial, mostly pseudo-bulbous (with stems in some species); leaves plicate, membranous . . . . . *32. Calanthe.*

Pollinia 2 or 4 (4 in the genera *Cremastra*, *Oreorchis*, *Sarcochilus*, *Stereochilus*, *Dendrocolla*, and *Tainiophyllum*).

* Rhizomatous, saprophytic, aphyllous; flowers in sparse racemes . . . . *33. Yoania.*

** Terrestrial, pseudo-bulbous; flowers in pedunculate racemes, rarely in panicles, sometimes spurred; leaves plicate, membranous, many-nerved.

Lip saccate or shortly spurred at the base, 3-lobed, the lateral lobes shallow and embracing the column . . . . . *34. Eulophia.*

Lip broadly ventricose at the base, not spurred, obscurely 3-lobed, inflorescence decurved while in flower . . . . . *35. Geodorum.*

Lip linear, parallel to the column, minutely saccate at the base, not spurred, slightly dilated and 3-lobulate at the apex, the lateral lobules oblong and diverging, the terminal with a process at its base; pollinia 4 . . . . . *36. Cremastra.*

Lip oblong, shortly clawed, deflexed from the middle, gibbous or not at the base, 3-lobed; the lateral lobes short, not diverging; the terminal broad, bifid, with no process at its base; pollinia 4 . . . . . *37. Oreorchis.*

*** Epiphytal, rarely terrestrial, with long linear sheathing leaves on a usually large fleshy pseudo-bulb, rarely with fusiform stems and few leaves; scapes racemose, flowers elongate, column without a foot or with a very short one, lip never spurred; leaves coriaceous . . . *38. Cymbidium.*

**** Epiphytal with very short stems and a few closely clustered flat coriaceous pendulous leaves; sepals and petals more or less spreading, united to the foot of the column.

Lip with forked appendages on its disc.

Lip not spurred; column short, with two horn-like processes near its base and a short foot . . . . . *39. Phalænopsis.*

Lip spurred, column narrowly winged but not horned, foot long . . . . . *40. Doritis.*

Lip without forked appendages on its disc.

Lip sessile on the rectangular foot of the column, 3-lobed, the disc with four calli; side lobes small, erect, triangular, falcate; apical lobe fleshy, triangular, sub-acute . . . . . *41. Biermannia.*

***** Epiphytal with short stem and a few broad pendulous coriaceous leaves; flowers in long racemes, sometimes branched; column with a very short foot; lip with a large claw, a bent spur and a 2-lobulate apical lobe, the lateral lobules fimbriate . . . . . *42. Ornithochilus.*

****** Epiphytal with fleshy usually elongated stems; leaves coriaceous and flat, or terete and fleshy; inflorescence racemose or panicled; pseudo-bulbs none; lip spurred or not.

Lip not spurred.

Lip adnate to the column.

Leaves terete; flowers two or three in very short racemes, or solitary . . . . . *43. Luisia.*

Leaves flat.

Apical lobe of lip laterally compressed and with two apical setæ; peduncle short, few-flowered . . . . *44. Diploprora.*

Apical lobe of lip thick, concave, laterally compressed, entire at the apex . . . . . *45. Stauropsis.*

Apical lobe of lip very obscure, minute, side lobes very large; pollinia 4. . . . . *46. Sarcochilus.*

Lip jointed to the column . . . . . *47. Arachnanthe.*

Lip spurred (gibbous in one Vanda).

Lip adnate to the column, or to its foot.

Column with a long foot, produced into a long spur without callus or septum in its interior . . . . . *48. Ærides.*

Column with no foot or with a very short one.

Spur with no callus or septum in its interior.

Spur deep, much compressed laterally, pubescent at the mouth, side lobes none . . . . . *49. Rhynchostylis.*

Base of the lip sometimes only gibbous, but usuall with a widely infundibuliform spur glabrous at the mouth, not compressed; side lobes large; apical lobe fleshy (thin in *V. teres*) with many caruncled glabrous ridges, sepals and petals broad, but often tapered to a narrow base; flowers large, caudicle of pollinia broad . . . . . *50. Vanda.*

Base of the lip with a long narrow cylindric or short wide saccate spur, not compressed; side lobes of lip none or small; apical lobe either small and smooth or large and carunculate or fimbriate; flowers small; caudicle of pollinia narrow . . . . . *51. Saccolabium.*

Interior of spur occluded by a dorsal scale or by calli on the front and back walls, but with no septum.

Rostellum short, straight; pollinia 2. . . . . *52. Cleisostoma.*

Rostellum long, pollinia 4 . . . . . *53. Stereochilus.*

Interior of spur with calli and with a vertical antero-posterior septum dividing the spur into two lateral chambers . . . . . *55. Sarcanthus.*

Lip jointed to the column.

Lip jointed to the footless column, large, 3-lobed, its spur wide and without septum; pollinia 4 . . . . . *56. Dendrocolla.*

Lip jointed to the long foot of the column, fleshy, with a narrow cavity, its spur thick-walled and without calli or septum; pollinia 4 . . . . . *57. Ornitharium.*

******* Epiphytal, without either pseudo-bulb or stem; leafless at flowering time; flowers minute, in short racemes; petals entire; lip with a short wide spur, sessile on the column; pollinia 4 . . . . . *58. Taeniophyllum.*

GROUP II.—Anther dorsal.

Pollinia 4, in two pairs.

Rostellum and caudicles very long, the latter tapering to the minute gland . . . . . *54. Camarotis.*

Each pair of pollinia enclosed in a funnel-shaped cup attached to a short free caudicle; the caudicles inserted on a large emarginate gland . . . . . *59. Podochilus.*

Pollinia sessile on a large fleshy gland, caudicles none . . . . . *60. Risleya.*

Pollinia 8.

Leaf terete, continuous with the terete stem.

Column deeply lobed at the apex, the anther lying between its lobes; pollinia clavate-cylindric, attached to a short broad caudicle; gland caudate . . . . . *61. Ceratostylis.*

Stem with numerous short equitant leaves.

Column not deeply lobed; pollinia clavate, four of them small and imperfect, attached to a slender elongated caudicle, gland small . *62. Appendicula.*

Pseudo-bulbous; leaves solitary or in pairs, flat.

Apex of the column acuminate, the caudicles of the pollinia pointing upwards . . . . . *63. Thelasis.*

Column with broad truncate horizontal apex on which the anther lies, the pollinia and caudicle horizontal, the caudicle joining the gland of the vertical rostellum at a right angle . . . . *64. Phreatia.*

25. Tipularia, Nutt.

Terrestrial, with small pseudo-bulbs. *Leaf* solitary, ovate, shortly petiolate. *Inflorescence* from the base of the pseudo-bulb, much longer than the leaf, erect, slender. *Flowers* laxly racemose. *Sepals* and *petals* sub-equal, lanceolate, spreading. *Lip* consisting chiefly of a spur slightly longer than the petals, slender, and curved forward; the side lobes short, narrow, rounded, each bearing a callus; the mid-lobe ovate-lanceolate, deflexed. *Column* rather broad, straight, without wings; anther terminal, depressed, 2-celled; *pollinia* 4, attached to a slender caudicle ending in a gland and projecting beyond the end of the rostellum. Two species; the following and one North American.

TIPULARIA JOSEPHI, Reichb. fil. ex Lindl. in Journ. Linn. Soc. I, 174.

Pseudo-bulb sub-globular, pointed, ·65 in. long. *Leaf* broadly ovate, acute, the edges undulate, the base rounded, suddenly contracted into the short petiole, plicate, 5- to 7-nerved, coloured, length 3 to 5 in., breadth 1·65 to 2·5 in. *Inflorescence* 8 to 12 in. long, with one or two narrow bracteoles ·3 in. long on its peduncle, the raceme occupying its upper fourth. *Flower* ·3 in. long; *floral bracts* broad, minute; lateral lobes of the lip with thick oblong calli, meeting a similar callus from the front of the column and almost occluding the mouth of the spur. Hook. fil. Fl. Br. Ind. V, 708.

Temperate Sikkim-Himalaya, at elevations of 10,000 to 12,000 feet, Sir J. D. Hooker; at Poang-gaon 12,000 feet, Pantling, No. 340; flowering during August.

PLATE 207.—*Tipularia Josephi*, Reichb. fil. A plant; *of natural* size. Fig. 1 a flower, 2 stalked ovary, column and lip, *seen from the side*, 3 column, and section of lip and its spur, 4 column, *front view*, showing the terminal anther, projecting pollinia and caudicle, stigma, base of column with its forward projecting callus, and sections of the side lobes and of their inward-projecting calli, 5 empty anther, *seen from its posterior end*, ·6 pollinia and caudicle; *all enlarged*.

26. Monomeria, Lindl.

Epiphytal. Pseudo-bulbs on a stout rhizome, each bearing a single coriaceous petiolate leaf. *Scape* from the base of a pseudo-bulb, laxly racemose, horizontal. *Flowers* rather large, ringent. *Sepals* unequal; the dorsal parallel to the column, ovate, acuminate; the lateral pair far removed from the dorsal and much larger, attached near the middle of the long curved naked foot of the column, coherent both at base and apex. *Petals* minute, broad but very short, fimbriate. *Lip* about as long as the dorsal sepal, jointed on the foot of the column, mobile, panduriform, with two diverging horn-like lobes at the base and two erect lamellæ on the disc. *Column* short, very broad, winged, toothed at the apex, the foot long and much curved. *Pollinia* 4, unequal, cohering into a sub-globular mass and attached to a caudicle ending in an ovoid-globose viscid gland. Distrib. Two closely allied species—one from the Himalayan and Khasia Hills; the other from Burma. The Burmese one may only, however, be a variety.

This genus combines the habit of *Bulbophyllum* and of *Cirrhopetalum* with the caudiculate pollinia of *Vandeæ*. The broad very short fimbriate petals are its chief distinguishing character.

MONOMERIA BARBATA, Lindl. in Wall. Cat., 1978.

Rhizome woody, ·25 in. thick. *Pseudo-bulbs* 2 to 3 in. apart, ovoid or elliptic, shrivelled at flowering time, 1·5 to 2 in. long. *Leaf* oblong, with a blunt emarginate apex, 7 to 12 in. long, and 1 to 1·25 in. broad; petiole 2·5 to 3 in. *Scape* nearly as long as the leaves, dark purple, the sheaths with peduncle ·35 to ·5 in. long. *Flowers* ·8 to 1 in. long, *floral bract* short. *Lateral sepals* nearly twice as long as the dorsal, conjoined and decurved at the apex, the margins reflexed, the upper surface hispid in its outer half. *Lip* deflexed from about the middle, the lamellæ of the disc converging. *Stigma* with 2 glands on the lower margin. *Caudicle* of pollinia brittle, the gland ovoid-globose. Lindl. Gen. and Spec. Orchid, 61; Sert. Orchid, *frontispiece;* Hook. fil. Fl. Br. Ind. V, 781.

Sikkim, in tropical valleys; in flower during February; Pantling, No. 124. Nepal; Wallich. Khasia Hills; Rita.

The flowers are yellow with bold brown markings, the ovary is brown and the pseudo-bulbs are tinged with the same colour.

PLATE 208.—*Monomeria barbata*, Lindl. Plant, *of natural size*. Fig. 1 side view of a flower, 2 front view of the same, 3 lip seen from the base, 4 petals, 5 column, 6 anther, 7 and 8 pollinia; *all enlarged*.

27. Acrochæne, Lindl.

Epiphytic; pseudo-bulbs on a stout rhizome, each bearing a single linear-oblong coriaceous petiolate leaf. *Scape* from the base of a pseudo-bulb, pendulous; the raceme long, lax, many-flowered. *Flower* rather small, the *floral bract* large and persistent. *Sepals* sub-equal, spreading, the lateral pair obliquely adnate to the foot of the column. *Petals* shorter than the sepals, ciliate-fimbriate, spreading. *Lip* with a short claw incumbent on and articulated to the end of the long foot of the column, 3-lobed, the basal lobes erect and broadly toothed at the apex; the apical lobe narrow, acute and deflexed. *Column* short, its foot long and straight. *Anther* broad, terminal, opercular, 2-celled. *Pollinia* 2, sub-globose, each cleft above and attached below to a stout caudicle enlarged at the base into a gland-like body.

A monospecific genus characterised by its saccate mentum, spreading fimbriate petals and two large sub-globular cleft pollinia attached to a stout caudicle which expands at the end into a depressed globular swelling.

Acrochæne punctata, Lindl. Fol. Orchid., 1.

Pseudo-bulbs ovoid, 1 to 1·5 in. long about 1 in. apart, shrivelled when in flower and with a dark brown coriaceous skin; the rhizome woody, ·3 in. thick. *Leaf* with an oblong obtuse emarginate blade 6 to 9 in. long and about 1·5 in. broad, tapered at the base into a petiole 3 to 5 in. long. *Scape* pendulous, 9 to 15 in. long, the peduncle with several broad bracts ·5 to 1 in. long. *Flowers* glaucous, about 1 in. across; *floral bract* ovate-lanceolate, ·5 in. long, the stalked ovary ·75 in. long. Dorsal *sepal* elliptic-ovate, acute; the lateral pair falcately triangular, sub-acute, 7-nerved, the lower margin undulate and slightly gibbous at the base. *Petals* narrowly triangular, shorter than the dorsal sepal. *Lip* with a short sigmoid claw; the side lobes erect, short, their apices blunt toothed and pointing forward; apical lobe tongue-shaped, with a deep groove on its upper surface extending from the base to the middle; lower margin of anther toothed. The foot twice as long as the column and forming with the lateral sepals a saccate mentum. *Capsules* clavate, spotted, rather more than an inch long, those of the previous year dehiscing as the flowers open. Reichb. fil. in Walp. Ann. VI, 635. *Bulbophyllum Kingii*, Hook. fil. Fl. Br. Ind. V, 760; Ic. Plantar., 2053.

Sikkim, at elevations of from 5,000 to 6,000 feet; Pantling, No. 25; in flower during October and November.

The flowers are of a pale yellowish-green, dotted and streaked with purplish-brown.

Plate 209.—*Acrochæne punctata*, Lindl. A plant; *of natural size*. Fig. 1 a flower, front view, 2 column and its foot, anther *in situ* and lip, seen from the side, 3 lip, 4 column with anther and foot, 5 anther, 6 pollinia, front and back views; *all enlarged*, 7 capsules; *of natural size*.

28. Agrostophyllum, Blume.

Epiphytes with sheathed compressed stems and no pseudo-bulbs. *Leaves* membranous, distichous, linear, with large flattened persistent sheaths. *Flowers* very small, white, single or in pairs on membranously sheathed pedicels, crowded in dense small almost sessile terminal heads. *Sepals* erect, conniving, concave. *Petals* broad or narrow,

spreading. *Lip* adnate to the column or to its foot, short, erect, entire or 3-fid, with or without a spur. *Column* short, stout, thickened towards the apex, with no foot or with a very short one. *Anther* 2-celled. *Pollinia* 8, clavate or elliptic, attached to a single viscus or gland. Species seven; Indian and Malayan.

Stems tufted, petals oblong, narrow, acute; lip spurred, column with no foot	1. *A. khasianum.*
Stems rising from a rhizome 1 to 1·5 in. apart; lip not spurred; column with a short foot.	
Flower-heads 1·25 in. in diam.; flowers ·125 in. across; lip with a simple callus at the very base; column not winged	2. *A. myrianthum.*
Flowers-heads 1·5 in. in diam.; flowers ·25 in. across; lip with a large bifid basal callus; column not winged, clinandrium entire, caudicle attached to a globular viscid ball	3. *A. callosum.*
Flower-heads ·75 in. in diam.; flowers ·25 in. across; lip with four calli between its lateral lobes, column slightly winged near the apex, clinandrium dentate, caudicle of pollinia attached to a cordate gland	4. *A. brevipes.*

1. Agrostophyllum khasianum, Griff. in Calc. Journ. Nat. Hist. IV, 378, t. 19.

Stems tufted, double fusiform, much compressed, bearing several membranous imbricate unequal sheaths in the lower part and in the upper three or four leaves with large loose sheaths. *Leaves* thickly membranous, narrowly oblong, tapering to each end; the apex blunt, slightly oblique, minutely notched; the base tapering into the short channelled petiole. *Head* ·75 in. in diam., on a very short peduncle carrying many pedicels each bearing two flowers enclosed in large membranous sheaths. *Flowers* ·2 in. across; *floral bract* lanceolate, shorter than the stalked ovary. *Sepals* oblong, acute, the lateral pair oblique. *Petals* rather shorter than the sepals, narrowly oblong, the apex acute, the margins recurved. *Lip* constricted in the middle, the part below the constriction saccate, the part above it transversely oblong or reniform, blunt, minutely notched at the apex, the edges undulate. *Column* broad, with a constriction and two marginal processes below the stigma, foot none. Lip of the *anther* pointed in front. *Pollinia* clavate, attached to a sub-rotund viscus. Hook fil. Fl. Br. Ind. V, 824. *A. planicaule*, Reichb. fil. in Walp. Ann. VI, 909. *Appendicula Hasseltii*, Wight Ic., t. 1748, p. 3. (*not of Blume*). *Eria planicaulis*, Wall. MSS.

Sikkim, in tropical valleys; in flower during August; Pantling, No. 280. Khasia Hills, at 2,000 feet; Gibson, J. D. Hooker and T. Thomson. Manipur; C. B. Clarke. Andamans, Helfer (5219 Kew Distrib.) and others.

The flowers are white with patches of pale yellow on the apical lobe of the lip and of ochre colour on the spur and column. The entrance to the spur is blocked by a callus on the base of the lip.

Plate 210.—*Agrostophyllum khasianum*, Griff. A plant; *of natural size.* Fig. 1 a flower, seen from the front, 2 floral bract, stalked ovary, column, anther and lip, seen from the side, 3 section through apex of ovary, column, anther and lip, 4 lip, 5 front view of column with anther *in situ* and stigma, 6 anther, 7 pollinia; *all enlarged.*

2. AGROSTOPHYLLUM MYRIANTHUM, *new species.*

Rhizome stout, woody, clothed with adpressed lanceolate scales. *Stems* 2 feet long, rising about 1·5 in. apart, sub-cylindric, clavate, many-leaved. *Leaves* linear-oblong, thickly membranous, the apices blunt and notched, narrowed below to the short sub-tubular sheath; length 3·5 to 4·5 in., breadth ·4 to ·5 in. *Capitula* hemispheric, 1·25 in. in diam., densely crowded. *Flowers* ·125 in. wide, yellowish; *floral bract* narrow, ovate, acute, half as long as the cylindric sessile ovary; bract of suppressed pedicel spathaceous. *Sepals* ovate-orbicular, blunt, concave. *Petals* narrower, blunt. *Lip* as long as the sepals, oblong, 3-lobed; the side lobes rounded and with a large callus between them at the base; apical lobe broadly ovate, the apex broad, entire or very slightly notched. *Column* short, not winged at the apex, its foot also short. Lip of *anther* emarginate; *pollinia* sub-equal, attached to a small viscus.

Sikkim, in the valley of the Teesta, at an elevation of 1,200 feet; in flower during August; Pantling, No. 459.

A species allied to *A. callosum*, Reichb. fil., but differing from that species in its larger heads of smaller flowers, and in its broader leaves. This differs from *A. brevipes* in having a single basal callus on the lip and in having no calli on the disc above the base. The flowers are of a uniform yellowish colour throughout.

PLATE 211.—*Agrostophyllum myrianthum*, King and Pantling. A plant; *of natural size.* Fig. 1 a flower, front view, 2 side view of floral bracts, ovary, column and lip, 3 lip, 4 vertical section of lip showing the position of the basal callus, 5 column with anther, 6 empty anther, 7 pollinia; *all enlarged.*

3. AGROSTOPHYLLUM CALLOSUM, Reichb. fil. in Seem. Fl. Viti, 296.

Rhizome stout, branching, clothed with thick triangular scales ·25 in. long. *Stems* rising from the rhizome 1 or 2 in. apart, erect, one or two feet in height, slender at the base and only slightly thickened upwards. *Leaves* numerous, sessile, linear-oblong, tapering gradually from the base to the notched apex; length 6 in., breadth at the widest part ·5 in. *Head* densely-flowered, 1·5 in. in diam. *Flowers* ·25 in. long; *floral bract* spathaceous, about as long as the sessile ovary. *Sepals* ovate, blunt. *Petals* broadly elliptic, very obtuse. *Lip* 3-lobed; the side lobes broad, rounded; the apical lobe decurved, ob-reniform, the apex emarginate; the basal callus large, divided into two diverging lobes each ending in a thickened blunt point opposite the sinus separating the apical from the basal lobes. *Column* stout, with a short foot. Lip of *anther* entire. *Pollinia* elongate-clavate, attached by elastic threads to a globular viscus. Hook. fil. Fl. Br. Ind. V, 824.

Sikkim, common at elevations of about 6,000 feet; Pantling, No. 477; in flower during June and July.

The flowers of this are of a reddish colour. The gland of the pollinia is not truly *Vandaceous*, and is in reality only a globular viscus to which the pollen masses are attached by elastic threads. The relation to this to *A. brevipes* has been explained under that species.

PLATE 212.—*Agrostophyllum callosum*, Reichb. fil. A plant; *of natural size.* Fig. 1 front view of flower, 2 side view of bract, ovary, column and lip, 3 the lip, 4 vertical section of the lip, 5 column and its short foot, the anther *in situ*, 6 an empty anther, 7 pollinia; *all enlarged.*

4. Agrostophyllum brevipes, King and Pantling.

Rhizome thin, covered with spreading subulate scales. *Stems* 10 to 12 in. long, erect, clavate, rising from the rhizome about an inch apart, slightly compressed, clothed in the lower half with large imbricate membranous sheaths about 1 in. long. *Leaves* membranous, linear-oblong, widest at the sessile sheathing base; the apex sub-acute, minutely bifid; length 1·5 to 5 in., breadth ·2 to ·35 in. *Head* ·75 in. in diam., composed of numerous 2-flowered pedicels on a very short common peduncle. *Flowers* ·25 in. in diam., white. *Sepals* sub-equal. *Petals* sub-orbicular, 5-nerved. *Lip* about the same length, oblong, 3-lobed, concave, not spurred or saccate; the lateral lobes broad and rounded with a large callus between them and two smaller conical calli between these and the oblong shortly bifid smooth terminal lobe. *Column* short, slightly winged near the apex, the foot very short, the clinandrium dentate. Lip of *anther* acute. *Pollinia* 8, unequal, all cohering by a short caudicle to a small cordate gland. *Capsule* narrowly ellipsoid, ·35 in. long. *A. callosum*, Reichb. fil. Hook. fil. Fl. Br. Ind. V, 824 (*in part*).

Sikkim, at elevations of about 2,000 feet; in flower during June and July; Pantling, No. 34.

All the parts of the flower in this species are white, with the exception of the column and anther which are dark crimson. This species differs from true *A. callosum*, Reichb. fil., with which it has hitherto been confused, in being a smaller plant, with stems half the length of those of true *A. callosum*, fewer and shorter leaves, smaller flowers in smaller heads, a winged column with a longer foot, and a fully developed cordate polliniar gland. This moreover is practically a tropical species, not ascending to more than 2,000 feet; whereas true *A. callosum* occurs at elevations of about 6,000 feet.

Plate 213.—*Agrostophyllum brevipes*, King and Pantling. A plant; *of natural size*. Fig. 1 side view of a flower with its bract, attached to its pedicel, the other flower being cut off, 2 apex of column, anther and lip, side view, 3 lip, 4 column and anther, 5 under surface of empty anther, 6 pollinia; *all enlarged*.

29. Ritaia, *n. gen.*, King and Pantling.

Epiphytal; stem much and sub-dichotomously branched, densely clothed with scarious sheaths; the branches short and bearing a terminal, sheathed, 1- or 2-flowered peduncle. *Leaf* fleshy, lanceolate, jointed to the axis at the end of a branch. *Flowers* small, puberulous. Lateral *sepals* with broad bases adnate to the produced foot of the column, and with acuminate connivent apices. *Lip* adnate by its margins to the column and its foot and forming with them a wide short sac septate and pubescent at the mouth; its anterior part very fleshy, convex, entire, sub-orbicular. *Anther* on the apex of the column broad, depressed, 8-celled. *Pollinia* 8, unequal (four being smaller), united by fours to a single elongate gland.

A genus resembling *Appendicula* to some extent in habit, but with more branching stems and a fewer-flowered inflorescence. It differs widely from *Appendicula*, however, in having the anther on the summit of the column instead of on the back of it; in having 4 pollinia instead of 8; in having a septum at the mouth of the sac formed by the adhesion of the edges of the lower part of the lip to the column; and in the anterior part of the lip being a solid fleshy sub-orbicular mass. We have dedicated the genus to Mr. Rita, of the Khasia Commission, an enthusiastic collector of orchids, to whom we are much beholden for most efficient assistance in the exploration of the Orchid Flora of the Khasia Hills.

Ritaia himalaica, King and Pantling.

Stem pendulous, sub-dichotomously branched, clothed throughout with imbricate scarious strongly-nerved sheaths; the branches short, each bearing a single terminal peduncle and a solitary leaf. *Leaf* fleshy, linear-oblong, jointed to the axis, its apex obliquely notched and acute, its base tapering to the short petiole; length 2·5 to 4 in., breadth about ·3 in. Peduncle from the axis at the side of the base of a leaf, sheathed by two bracts and with two small opposite scarious sub-rotund bracteoles at its base, 1-flowered or occasionally 2-flowered. *Flowers* ·25 in. long., pale yellow, pubescent externally; the *floral bract* ovate, acute, sheathing, rather longer than the sessile ovary. Dorsal *sepal* ovate-lanceolate, concave, sub-acute; the lateral pair broader, abruptly and bluntly acuminate, incurved. *Petals* about as long as the sepals, spreading, linear, acute. *Lip* fleshy, not lobed, its lower part attached to the inner half of the column and to its foot to form a short wide sac with a septate pubescent mouth; the anterior part of the lip thick, fleshy, convex, sub-orbicular, notched at the apex. *Column* very short with a short foot. *Stigma* broad and flat. *Anther* 4-celled, terminal. *Pollinia* 8, clavate, unequal, connected by granular threads to a small oblong gland. *Ceratostylis himalaica*, Hook. fil. Ic. Plant., t. 2101; Fl. Br. Ind. V, 826.

Sikkim, at Tendong, elevation 5,000 feet; in flower during May and June; Pantling, No. 149.

Plate 214.—*Ritaia himalaica*, King and Pantling. A plant; *of natural size*. Fig. 1 pedicel with its basal bracts, floral bract, ovary and flower, side view, 2 flower, front view, 3 half profile view of column, lip and sac, the sepals and petals having been cut off, 4 view from above of the clinandrium (*c*), the anther having been removed, septate mouth of spur and lip, 5 empty anther, 6 pollinia; *all enlarged.*

30. Ione, Lindl.

Epiphytal; pseudo-bulbs from a creeping rhizome, 1-leaved. Scape from the base of a pseudo-bulb. *Flowers* elongate, solitary, in pairs, or in secund or distichous racemes. *Sepals* membranous; the lateral pair more or less coherent under the lip by their inner edges. *Petals* smaller than the sepals, spreading. *Lip* attached to the foot of the column by a broad base, entire, not mobile, equalling or exceeding the sepals in length, fleshy in the centre and produced at the apex into a tongue-like point, sometimes not fleshy and sometimes with an emarginate apex. *Column* short, with no foot or with a short one; the rostellum formed by two undivided broad and deflexed elongate processes. *Pollinia* 4, equal in size, ellipsoid, attached by pairs to two elongated elastic caudicles, without or with a gland or glands. About eight species; natives of the mountains of India and Ceylon.

The form and functions of the rostellum and of the caudicles of the pollinia in this genus can be understood only by examination of fresh flowers. In *I. paleacea* and *I. bicolor* the rostellum consists of two long narrow downward-pointing processes. The four pollinia are of the same size and shape, and they lie in a horizontal row, all being equally exposed. They are attached by pairs to two elongated tapering caudicles of tough elastic tissue which rather exceed the rostellar processes in length. The caudicles lie on the upper surfaces of the rostellar processes, but, being longer, their ends, which are quite free, project beyond the extremities of the former. Each of these free ends is provided on its lower surface with a little mass of viscid adhesive substance. When one of these caudicles is removed by allowing its viscid end to adhere to a thin rod of wood, the two pollinia at its apex are soon seen to fall slowly forward, owing to the bending of the caudicle. In *I. bicolor*

this bending proceeds (as is shown in Plate 216, fig. 5) until it forms a complete fold, the convexity of which is directed forwards. In *I. paleacea* the bending is much less complete, the caudicle making only a slight sigmoid curve (as is seen in Plate 215, fig. 6). These arrangements resemble those which obtain in *Vandeae* rather than in *Epidendreae*. The resemblance to *Vandeae* in structure is, however, still greater in *Ione intermedia*. In that species the caudicles are similar in shape to those in the two species just referred to, except in not being free at the lower end. The rostellum, however, is very different; for, instead of consisting of two distinct elongated processes, it consists of a single broad curtain-like mass of tissue (Plate 218, fig. 2), projecting continuously along the whole upper margin of the stigma, and having in the middle a reniform disc of viscid substance, to which disc the ends of the caudicles are firmly attached. On removing this viscid disc, both caudicles, with their attached pollinia, come away together. There is, however, very little movement after removal; for the pollinia fall forward only very slightly and the caudicles scarcely bend at all. On account of the structural peculiarities above set forth, we consider that the genus *Ione* forms a link between the tribes *Epidendreae* and *Vandeae*, having the general appearance and habit of several genera of the former, combined with the pollinia of the latter; and this opinion receives considerable support from the functional phenomena just described. We have therefore ventured to dissociate the genus *Ione* from *Bulbophyllum* and its neighbourhood, and to place it in *Vandeae*. Other reasons for the separation of *Ione* from *Bulbophyllum* are to be found in its large and immobile lip, which is firmly attached by its broad base to the short foot of the column, the lip of *Bulbophyllum* being characterised by its comparatively small size, and by its mobility. The foot of the column also is usually rather elongate in *Bulbophyllum*, while in *Ione* it is very short. To this genus we have reduced *Sunipia*, as careful dissections of fresh flowers show that the structure of the flowers is practically the same as that of *Ione*.

Since the above was written, we have discovered the new species described below under the name of *I. Andersoni*. In this species, each of the caudicles ends in a most distinct viscid stigmatic gland. Since this discovery we have no hesitation in removing the genus *Ione* to the tribe *Vandeae*.

Caudicles without glands—
- Flowers about 1 in. long, in elongate secund racemes . . . . . 1. *I. paleacea.*
- Flowers ·4 in. long, in distichous short racemes . . . . . 2. *I. bicolor.*

Caudicles attached to two glands . . . . . 3. *I. Andersoni.*

Caudicles attached to a single gland—
- Pedicel not longer than the pseudo-bulb and with only 1- or 2-flowers . 4. *I. intermedia.*
- Scapes longer than the leaves, many-flowered . . . . . 5. *I. scariosa.*

1. Ione paleacea, Lindl. Fol. Orchid. 2.

Rhizome ·2 in. thick, naked; pseudo-bulbs about 1 in. short, ovoid or obpyriform, slightly wrinkled, 1·25 to 1·4 in long. *Leaf* narrowly oblong, the apex blunt, sub-retuse, much narrowed to the base, sessile, 4 to 8 in. long, and ·75 to 1·15 in. broad. *Scape* much longer than the leaf; the pedicel with two or three sheathing bracts; raceme shorter than the peduncle, secund, sparsely-flowered. *Flowers* ·9 to 1·1 in. long, drooping; *floral bract* scarious, broadly lanceolate, convolute, as long as or longer than the long-pedicelled ovary. *Sepals* sub-equal, lanceolate-oblong, acuminate, the dorsal slightly shorter than the connate lateral pair, all transparent, with pink reticulations. *Petals* spreading, much smaller than the sepals, broadly oblong, blunt, erose-serrulate, 1- to 3-nerved, similarly coloured to the sepals. *Lip* dark purple, nearly as long as the sepals, oblong-lanceolate, the base thickened and connate with the very short foot of the column, not jointed, tapering to the sub-acute apex; upper surface with a cancellated two-chambered callosity in the middle, thickest near the base and passing towards the somewhat convex apex into a grooved ridge, the edges entire or crenate. *Column* short, the rostellum consisting of two deflexed subulate processes; the foot at right angles to the column, very short. *Anther* sessile on the column; *pollinia* 4, elliptic,

in two pairs, each pair attached to a long cartilaginous caudicle lying on the upper surface of a rostellar process, free and adhesive at the end. Bot. Mag., t. 6344 (*excl. syn. Griff.*); Walp. Ann. VI, 636; Benth. in Gen. Plantar. III, 503. *Bulbophyllum paleaceum*, Hook. fil. Fl. Br. Ind. V, 769.

Sikkim, elevation about 6,000 feet; very common. Pantling No. 100; in flower during October and November. Bhutan; Clarke, Gamble.

The sepals and petals are translucent greenish-white, with numerous netted pink nerves. The lip is of a deep purple with two pale lines towards the middle; the sub-acuminate apex being of a paler purple.

PLATE 215.—*Ione paleacea*, Lindl. A plant; of *natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with its foot and the lip, 3 callosity near the base of the lip showing its two chambers, the narrow groove separating them and their cancellated structure, 4 column with pollinia *in situ* and the foot, 5 pollen masses and their caudicles, front view, 6 pollen mass, side view; *all enlarged*.

2. IONE BICOLOR, Lindl. Fol. Orchid. 3.

Rhizome about ·1 in. thick, naked; pseudo-bulbs about ·75 in. apart, obpyriform, the base sometimes very broad, ·5 to ·65 in. long. *Leaf* linear, obliquely bifid at the apex, slightly narrowed to the sub-sessile base; length 2·5 to 4 in. *Scapes* solitary or in pairs, somewhat shorter than the leaves; the peduncle about equal to the raceme, minutely bracteate. *Raceme* with six to eight distichous flowers; *floral bract* lanceolate, longer than the stalked ovary. *Flowers* ·4 in. long. *Sepals* sub-equal, the single dorsal and the connate lateral pair widely diverging, lanceolate, acute, pale and translucent like the petals and with claret-coloured nerves. *Petals* elliptic, blunt, spreading at right angles to the sepals. *Lip* claret-coloured, panduriform, truncate at the base and with two minute auricles; the anterior part expanded and deeply serrate except at the emarginate apex; upper surface slightly concave, but with a white elliptic thickened process extending beyond the margin at the apex. *Column* short, the foot very short; rostellum consisting of two elongated processes on which rest the caudicles of the pollinia. *Pollinia* 4, equal, ovoid, attached by pairs to two elongated caudate-acuminate caudicles. Reichb. fil. in Walp. Ann. VI, 637. *Sunipia bicolor*, Lindl. Gen. and Spec. Orchid, 179; Sert. Orchid., *frontispiece*, fig. 5. *Bulbophyllum bicolor*, Hook. fil. Fl. Br. Ind. V, 770. *Ione khasiana*, Lindl. Fol. Orchid. 2; Reichb. fil. Walp. Ann. VI, 636. *Dipodium khasianum*, Griff. Notul., 354; Ic. Pl. Asiat., t. 327, fig. 2.

Sikkim, at elevations of 6,000 or 7,000 feet; very common; flowering October to December; Griffith, No. 5137; Pantling, No. 247. Nepal. Bhutan. Khasia Hills; Griffith (No. 5138), Hooker, Thomson, Mann.

PLATE 216.—*Ione bicolor*, Lindl. A plant; *of natural size*. Fig. 1 flower, front view, 2 bract, stalked ovary, column with its foot, anther, side view, 3 column, front view, 4 pollinia with their caudicles, 5 two pollinia with the caudicle after removal from the anther, 7 a capsule; *all enlarged*, 6 two capsules; *of natural size*.

3. IONE ANDERSONI, *new species*.

Pseudo-bulbs ovoid, ·3 in. long, attached close together or slightly distant from each other on a thread-like rhizome. *Leaf* sessile, narrowly elliptic-oblong, the apex blunt and slightly notched; length ·5 to 1·25, breadth about ·25 in. Peduncle erect, as long as the pseudo-bulb, 1- to 2-flowered. *Flower* ·35 in. across; *floral bract* lanceolate, half

as long as the stalked ovary. *Sepals* sub-equal, ovate, sub-acute, apiculate, strongly recurved (especially the lateral pair). *Petals* about as long as the sepals but much narrower, wide-spreading, lanceolate, blunt; the basal half dilated, membranous and with fimbriate edges; the apical half narrow, fleshy. *Lip* as long as the sepals, with a broadly orbicular cochleate base with narrow erect rounded erose side lobes and a fleshy tongue-like entire blunt apical lobe. *Column* very short. *Anther* with a fleshy cap containing two distant cells. *Pollinia* 4, ovoid, in two pairs, each pair lying remote from the other, attached to its own caudicle, and resting on its own short rostellum overhanging the stigma; the caudicles flattened, dilated upwards, each ending below in an ovate gland. *Stigma* large, transversely oblong, occupying the whole breadth of the column in its upper half.

Bhutan, near Buxa, at an elevation of about 6,000 feet; Anderson; Pantling's drawing No. 473.

The sepals and petals of this most interesting little plant are yellowish, and the lip is purple. Plants of it were collected above Buxa, in Bhutan, by Dr. A. R. S. Anderson, Surgeon-Naturalist to H. M. S. *Investigator*, and Officiating Superintendent of the India Museum, Calcutta. It has not as yet been found in Sikkim. It is, however, so small that it may easily enough have escaped observation in the latter province. We make no apology, however, for introducing it here, as it affords an excellent example of an *Ione* with unmistakeable glands to the caudicles of its pollinia, and thus strengthens the arguments for the inclusion of this genus in the tribe *Vandeae*. In this, as in other three of the five species here described, the pollen masses rest on the caudicles and are not attached to them by granular elastic threads as directly in the majority of typical *Vandeae;* but in *I. scariosa* such threads are present. The plant here figured, having been sent by Dr. Anderson, flowered at the Government Cinchona Plantation at Mungpoo in Sikkim in April 1897; and the drawing here reproduced was made there by Mr. Pantling.

PLATE 217.—*Ione Andersoni*, King and Pantling. A tuft of living plants; *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column with anther *in situ* and lip in profile, 3 and 4 column showing the two pairs of pollinia *in situ* with their caudicles and glands, and also the stigma, 5 the petals, 6 pollinia; *all enlarged*.

4. IONE INTERMEDIA, King and Pantling in Journ. As. Soc. Bengal, Vol. LXV, Part 2, p. 120.

Rhizome less than ·1 in. thick, naked; *pseudo-bulbs* ovoid, semi-transparent, ·5 in. long, less than ·1 in. apart. *Leaf* linear, notched at the apex, slightly narrowed to the sessile base, 2 to 4 in. long, and ·2 to ·25 in. broad. *Scape* only slightly longer than the pseudo-bulb, zig-zagged, enveloped at the base by two or three sheaths and bearing one or two flowers; floral bract lanceolate, equal to or longer than the shortly-stalked ovary. *Flowers* ·5 in. across, pale green. *Sepals* spreading, sub-equal, lanceolate, the lateral pair lying under the lip and coherent by their tips. *Petals* about half as long as the sepals, spreading, more or less twisted, linear, with dilated more or less denticulate concave bases. *Lip* slightly shorter than the sepals, lanceolate, with a dilated concave slightly auriculate base, and much elongate caudate-acuminate apex; the base with a very broad truncate claw attaching it to the very short foot of the column. *Column* short, broad, narrowly winged at the middle; *rostellum* broad, deflexed; *pollinia*

4, elliptic, equal, attached by pairs to elongate caudicles, the ends of which are attached to a viscid disc continuous with the stigma.

Sikkim, at Tendong, elevation about 6,000 feet; Pantling, No. 161.

A very remarkable species, the structure of the rostellum and pollinia of which are discussed in a note on page 156.

PLATE 218.—*Ione intermedia*, King and Pantling. A plant; *of natural size*. Fig. 1 a flower, front view, 2 bract, stalked ovary, column and lip, seen from the side, 3 the petals, 4 lip, 5 front view of the column showing the curtain-like rostellum and the pollinia with their caudicles *in situ* and viscid disc, 6 the pollinia and viscid disc removed; *all enlarged*.

5. IONE SCARIOSA, King and Pantling.

Pseudo-bulbs ovoid or obliquely ovoid, of spongy consistence, ·75 to 1·25 in. long, attached about an inch apart to a stout striate rhizome. *Leaf* coriaceous, narrowly oblong, on a short channelled petiole, the apex blunt and notched, slightly narrowed to the base; length 4 to 6 in., breadth ·65 to 1 in. *Scape* slender, erect, two or three times as long as the leaf; the peduncle with three or four scattered tubular truncate sheaths ·5 to ·75 in. long. *Raceme* deflexed, about half the length of the peduncle, its rachis compressed. *Flowers* numerous, rather distant, about ·3 in. long, distichous; *bract* very large, striate, scarious at flowering-time, ovate, cymbiform, acute, partly concealing the flower and entirely concealing the dorsal sepal. *Sepals* unequal, the dorsal ovate, concave, blunt; the lateral pair longer, oblong, acute, slightly incurved, and lying nearly parallel on the under-surface of the lip. *Petals* one-third as long as the lateral sepals, very broad, blunt, sub-retuse, the margins erose-denticulate, the bases broad and truncate. *Lip* fleshy, sessile on the base of the column, shorter than the lateral sepals, ovate-elliptic, blunt, without side lobes; the upper surface concave in its lower half and with a small oblong callus at the base immediately under the column. *Column* very short, without a foot. *Anther* sub-erect, sessile; its cells distant, dehiscing vertically. *Pollinia* 4, in two pairs, connected by elastic threads to two rather large oblong caudicles inserted by their lower ends on a single sub-quadrate adhesive gland bifid at each end and curved along the centre. *Stigma* large, orbicular, with the gland of the pollinia hanging in front of its centre. *Sunipia scariosa*, Lindl. in Wall. Cat., No. 7373; Gen. and Spec. Orch., 179; Orchid Scel., 25; Sert. Orchid., *Frontisp.*, No. 8; Fol. Orch. 1; Reichb. fil. in Walp. Ann. VI, 633; Hook. fil. Fl. Br. Ind. V, 772. *Ornithidium bracteatum*, Wall. MSS.

Sikkim, elevation 3,600 to 4,000 feet; not now common; Gamble, No. 10336; Pantling, No. 474; in flower during April and May. Nepal, Bhutan, Khasia, Tenasserim.

The flowers are greenish, flushed with dull purple.

Careful dissections of fresh flowers of all the Sikkim species attributed by Lindley to the genus *Ione* (1853) and of those of the single species of the genus *Sunipia*, (which Lindley attributes to Buchanan-Hamilton and which therefore must date prior to 1816), show that the flowers of the two have practically the same structure, and that one of these genera must fall. In reducing one the older would naturally be upheld. But we find it impossible to discover what Buchanan-Hamilton's *Sunipia* was. He never published any description of it, and no specimen bearing the name *Sunipia* in his handwriting is now extant. The earliest reference to *Sunipia* which we have been able to

trace is in an article in Rees' Cyclopædia (1816), Vol. XXIV, under *Stelis*. Smith, the author of the article alluded to, there describes, under the name *Stelis racemosa*, a plant which he says Dr. F. Buchanan found growing on trees in Nepal. The description which follows does not in the least suggest the plant named *Sunipia* by Lindley; and in the *Index Kewensis* it is given as a synonym of *Liparis odorata*, Lindl. (*L. paradoxa*, Reichb. fil.). The remaining Indian species of *Stelis* described by Smith are *S. hirta*, of which Smith says—"gathered by Dr. Buchanan on mossy rocks in Upper Nepal; flowering in January" (a month when *Sunipia scariosa*, Lindl., is never in flower). "The inhabitants," continues Smith, "call it *Sunipiang*, whence Dr. Buchanan named all the species of this section *Sunipia*, as composing a new genus, and the difference of their habit from the original *Stelides* countenances this measure." Smith's brief description of his *Stelis hirta* reads like that of a *Bulbophyllum*; and, in the *Index Kewensis*, the plant is identified with *Bulbophyllum hirtum*, Lindl. Smith's next species is *Stelis odoratissima*, "with capitate fragrant flowers." This has been identified, and rightly as we believe, with *Bulbophyllum odoratissium*, Lindl. Smith's last Indian *Stelis* is *S. biflora*, a 2-flowered plant found by Dr. Buchanan in Nepal. The description here again is that of a *Bulbophyllum*. Smith winds up with the following remark: "We find among Dr. Buchanan's drawings and descriptions several more species referred to his genus *Sunipia*, whose habit agrees exactly with our four last described. The parts of the flower, however, appear more unequal or irregular than properly belongs to *Stelis*, as is somewhat the case with our *S. biflora*. We leave them therefore (having no specimens) for the future illustration, as we hope, of their ingenious and accurate discoverer." The probability thus appears to be that the majority of Buchanan's species of *Sunipia* belonged to *Bulbophyllum*. Such, however, is the basis on which Lindley (in his *Orchidearum Sceletos*) built his monospecific genus *Sunipia*, attributing it to Buchanan-Hamilton, whose idea evidently was that *Sunipia* contained many species! It seems probable that the genus *Sunipia* never was defined by Buchanan, even in his own mind, in any but the vaguest possible manner; and he certainly never published any diagnosis of it. Smith, by including Buchanan's Nepalese plants in the South American genus *Stelis*, threw no light (but rather darkness) on their affinities. *Sunipia* is thus a legendary genus; *Ione*, on the other hand (although dating only from 1853), is an excellently defined genus, into which the plant named *Sunipia scariosa* by Lindley most naturally falls; and to that genus we, without any hesitation, now reduce it.

PLATE 219.—*Ione scariosa*, King and Pantling. Part of a plant; *of natural size*. Fig. 1 a flower. front view, 2 ovary, column with anther *in situ*, and lip, in profile, 3 petals, 4 apex of ovary and column showing the anther, pollinia and their appendages and the large sub-orbicular stigma, 5 the pollinia, one pair, in their natural relation to the caudicle, the other pair pulled away from the caudicle to show the elastic connecting threads; *all enlarged*.

31. Cryptochilus, Wall.

Epiphytal; pseudo-bulbs crowded, 2-leaved. *Leaves* coriaceous, usually petiolate. *Inflorescence* terminal, racemose, the peduncle naked. *Flowers* yellow or scarlet, secund, in distichous spikes, shorter than the subulate persistent *bracts*. *Sepals* connate in a sub-cylindric or urceolate tube, the acute apices alone free. *Petals* included. *Lip* included, adnate to the short foot of the column. *Column* erect, slightly dilated at the apex;

anther 2- or 4-celled; *pollinia* 8, cuneate or oblong, attached to a single gland. Species 2, both Himalayan.

In his *Genera and Species of Orchidaceous Plants*, Lindley referred this genus to *Vandeae*; but in the Botanical Register for 1838 (sub t. 23) he suggested its transference to *Epidendreae* in the neighbourhood of *Phajus* and *Acanthephippium*. Examination of living flowers of the plants as they grow in Sikkim shows that Lindley's first view was the correct one, and that the pollinia are connected to a gland which, prior to its removal from the flower, forms an integral part of the stigma. In *C. lutea* this gland is very large, while in *C. sanguinea* it is small.

Sepaline tube scarlet, pollinia green . . . . . *1. C. sanguinea.*
Whole flower yellow, pollinia yellow . . . . . *2. C. lutea.*

1. CRYPTOCHILUS SANGUINEA, Wall. Tent. Fl. Nep. 36, t. 26; Cat. 7530.

Pseudo-bulbs ovoid to elliptic, crowded, the adult sheathed at the base and bearing at the apex two linear-oblong acute thickly membranous leaves narrowed at the base to a short stout petiole; length 3·5 to 8 in., breadth ·85 to 1·5 in., petiole about ·5 in. *Racemes* from an undeveloped pseudo-bulb, on a stout erect peduncle longer than the leaves. *Flowers* ·8 in. long, scarlet, secund in two rows; *floral bract* nearly as long as the flower, erect. *Sepaline* tube slightly gibbous at the base, puberulous; its free apices divergent, triangular, acute. *Petals* oblanceolate, obtuse. *Lip* oblong, entire, slightly broader at the apex, somewhat deflexed from the curved base, smooth. *Column* stout, short, puberulous in front, the foot short. *Anther* short, 4-celled; *pollinia* 8, cuneate, sub-equal, attached to a rotund gland. *Capsule* oblong, erect, ·5 in. long. Lindl. Gen. and Spec. Orch., 193; in Journ. Linn. Soc. III, 21; in Bot. Reg. 1838, t. 23; Wight Ic. t. 1757; Reichb. fil. in Walp. Ann. VI, 461; Hook. fil. Fl. Br. Ind. V, 827.

Sikkim, at elevations of 5,000 to 7,000 feet, common; Pantling, No. 36; in flower from June to August. Distributed westward to Nepal and eastward to the Khasia and Naga Hills, at alt. 4,000 to 5,000 feet; Griffith, Prain and others.

The sepaline tube is scarlet with scattered white hairs, the free apices being dull dirty white to very dark purple; the petals, lip and column are bright yellow and the pollinia green.

PLATE 220.—*Cryptochilus sanguinea*, Wall. A plant; *of natural size.* Fig. 1 front view of the mouth of a flower, 2 petals, 3 lip, 4 column with its foot and anther *in situ*, 5 floral bract, ovary, column, anther and lip, in profile, 6 anther, 7 pollinia; *all enlarged.*

2. CRYPTOCHILUS LUTEA, Lindl. in Journ. Linn. Soc. III, 20.

Pseudo-bulbs crowded, cylindric, 1·5 to 3 in. long, bearing at the apex two narrowly elliptic, acute, fleshy leaves tapering into petioles, length 4 to 6 in., breadth ·65 to 1 in.; petioles ·65 to 1 in., sometimes much less. *Raceme* from a young pseudo-bulb, shorter than the adult leaves, its peduncle short or long. *Flowers* numerous, in two rows, sub-globular, glabrous, yellow, nearly ·25 in. long; *floral bract* much longer, linear-lanceolate, ovary pubescent. *Sepaline tube* urceolate, the triangular apices of the component sepals alone free. *Petals* narrowly and obliquely rhomboid, much narrowed at the base. *Lip* oblong, slightly expanded, grooved and thickened towards the apex,

curved at the base. *Column* short, dilated towards the bifid apex, the foot narrow and very short. *Rostellum* emarginate. *Pollinia* 8, yellow, oblong, in groups of four attached to a very large sagittately lobed gland. *Capsule* ellipsoid, ·25 in. long. Reichb. fil. in Gard. Chron., 1882, I, 733; Hook. fil. Fl. Br. Ind. V, 827.

Sikkim, at elevations of 5,000 to 7,000 feet; several collectors; Pantling, No. 86; in flower during May and June. Bhotan; Griffith (Kew Distrib. Nos. 5228, 5229, 5229-1). Naga Hills; at Kohima, Clarke.

PLATE 221.—*Cryptochilus lutea*, Wall. A plant; *of natural size*. Fig. 1 flower, 2 petals, 3 side view of ovary, column with its foot and lip, 4 lip, 5 front view of column, stigma, anther, 6 anther, 7 pollinia and gland; *all enlarged*.

32. Calanthe, Lindl.

Terrestrial, usually pseudo-bulbous. *Pseudo-stems* variable in length, often tall, sometimes absent. *Leaves* membranous, more or less elliptic-oblong, plaited. *Inflorescence* usually from amongst the leaves and axillary, or from the side of the stem or pseudo-bulb. *Flowers* usually rather large, sometimes inconspicuous, in erect racemes. *Sepals* sub-equal, usually spreading, more or less lanceolate or oblong, rarely connivent. *Petals* usually narrower than the sepals. *Lip* variously attached to the column either to its base or to its whole length, usually 3-lobed, the apical lobe often bifid, the disc usually lamellate. *Column* short, sometimes dilated at the base or apex. *Anther* usually conical, with an acuminate lip, 2-celled. *Pollinia* 8, waxy, clavate or elliptic, often unequal, cohering in fours to a granular caudicle, or the whole eight inserted on a single caudicle and attached to a gland. *Capsules* ellipsoid, drooping. Distrib. About 80 species; tropical or sub-tropical.

In this genus the inflorescence is produced on an undeveloped pseudo-bulb which also bears the young leaves. The latter (except in *C. alismæfolia*, *C. densiflora*, and *C. gracilis*), do not obtain their full size or develope their petioles until after flowering has ceased.

**Inflorescence on the same stem as the leaves.*

Flower without a spur.

Pseudo-bulbs none, stems thin, cylindric, flowers white, inflorescence lateral . 1. *C. gracilis.*

Pseudo-bulbs not more than 1 in. long.

Leaves 2 or 3, sub-equal; flowers green, edged with white outside; lip with short basal lobes and a small bilobed puberulous callus between them; apical lobe with a large fleshy 3-ridged caruncle . 2. *C. tricarinata.*

Leaves 5 to 7, very unequal, the lower reduced to sheaths; flowers lavender-coloured, lip with elongate basal lobes and two short calli on the disc between them; apical lobe without a callus . . . 3. *C. puberula.*

Flower with a very short straight conical spur.

Pseudo-bulbs short.

Lip attached to the whole length of the column.

Flowers ·2 in. in diam.; sepals and petals brownish; lip with lateral lobes . . . . . 4. *C. Mannii.*

Flowers 1 in. in diam.; sepals and petals brown with marginal green lines; lip clawed, trowel-shaped, white, without lateral lobes 5. *C. trulliformis.*

Lip attached to the column for half its length, 3-lobed, basal lobes diverging; apical lobe sub-obovate, with broad emarginate apex and irregularly toothed edges; flowers dull purple . . . . . 6. *C. brevicornu.*

Pseudo-bulbs 6 to 9 in. long, cylindric, stem-like, the peduncle and raceme equally long; lip without distinct lateral lobes, its terminal lobe large and divided into two diverging lobules; flowers yellow and violet, inflorescence lateral . . . . . 7. *C. biloba.*

Spur more than half as long as the ovary (quite as long in *C. herbacea.*)

Lip without lateral lobes, its edges deeply incised-pectinate . . . 8. *C. alpina.*

Lip 3-lobed.

Lateral lobes of lip oblong-oblanceolate, entirely incumbent on the terminal; lip with a large lobulate callus at its base, the apical lobe with large wide lobules . . . . . 9. *C. alismæfolia.*

Lateral lobes of the lip incumbent on the apical lobe by their tips only.

Raceme with about 20 flowers, floral bract as long as the stalked ovary; the lip with a carunculate callus at its base, its apical lobules broad, sub-obovate and diverging . . . . . 10. *C. angusta.*

Raceme with about 16 flowers; floral bract very short (·25 in. long), lip with a didymous callus at its base; its apical lobules broad, rounded, not diverging, spur half as long as the stalked ovary . . . . . 11. *C. chloroleuca.*

Lateral lobes of the lip spreading outwards, not incumbent on the apical one; raceme with about 15 flowers, floral bract half as long as the spur and as long as the stalked ovary; lip with carunculate callus at its base, its apical lobules narrowly oblong, sub-falcate, diverging . . . . . 12. *C. herbacea.*

Spur longer than the stalked ovary.

Lip 3-lobed; flowers violet, sepals and petals spreading . . . . 13. *C. Masuca.*

Lip without basal or lateral lobes; flowers yellow; sepals and petals more or less reflexed . . . . . 14. *C. Whiteana.*

***Inflorescence distinct from the leafy stem and rising direct from the rhizome; flowers yellow* . . . . . 15. *C. densiflora.*

1. CALANTHE GRACILIS, Lindl. in Wall. Cat., 7341; Gen. and Spec. Orch., 251.

Stems thin, cylindric, slightly swollen at the base, annular below and with a few tubular sheaths above. *Leaves* 5 to 8, elliptic or elliptic-oblong, shortly caudate-acuminate, narrowed towards the broad sheathing base, 3 to 4·5 in. long and 1·25 to 1·75 in. broad. Peduncles one to three, issuing singly from nodes near the middle or lower part of the stem, 6 to 9 in. long, with many tubular sheaths at the base, a long one about the middle, and at the apex a sparse *raceme* 4 to 6 in. long, both finely pubescent. *Flowers* ·75 in. across, spurless; *bract* lanceolate, acuminate, longer than the pubescent slenderly stalked ovary, caducous. *Sepals* equal, spreading, lanceolate, acuminate. *Petals* shorter than the sepals, obovate, acute, erose. *Lip* shorter than the sepals, adnate to the base only of the column; concave at the base and with large triangular erect side lobes with their anterior margins broad and erose; the apical lobe small, transversely oblong, deeply emarginate at the apex, the edges much undulate and coarsely erose; the upper surface with two lamellæ from the base nearly to the apex, the disc between the lamellæ with a granular callus at its base and with small nodules scattered over the rest of its area. *Column* short, dilated at the base; the apex with a tuft of hair behind the

anther. Lip of *anther* emarginate; *pollinia* 8, unequal, narrowly clavate, curved, attached to a small shield-shaped gland. Bot. Mag., t. 4714; Griff. Notul III, 367; Walp. Ann. VI, 922; Hook. fil. Fl. Br. Ind. V, 855. *C. longipes*, Hook. fil. Fl. Br. Ind. VI, 195. *Limatodes gracilis*, Lindl. Fol. Orch., 1.

Sikkim; at Rungbee, elevation 6,000 feet; King, Pantling No. 2; in flower during October.

The flowers are pure white, the lip having a yellow band along the centre, with a transverse band of a darker shade at the base of the apical lobe.

PLATE 222.—*Calanthe gracilis*, Lindl. Part of a plant; *of natural size*; an entire plant, *much reduced in size*. Fig. 1 a flower, 2 stalked ovary, column and lip, in profile, 3 lip, 4 column with anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

2. CALANTHE TRICARINATA, Lindl. in Wall. Cat., 7339; Gen. and Spec. Orch., 18.

Pseudo-bulb small, broadly ovoid, ·75 to 1 in. long. *Pseudo-stem* 3 to 8 in. long. *Leaves* 2 or 3, oblanceolate, acute, much narrowed in the lower half, petiolate or sessile; length 8 to 15 in., breadth 2 to 3 in. *Inflorescence* from the developing pseudo-bulb, sheathed by the young leaves and rising from the axil of one of them, longer than the adult leaves, 12 to 20 in. long, the peduncle longer than the laxly-flowered raceme, the rachis and stalked ovaries pubescent. *Flowers* ·75 in. across; *bract* lanceolate, shorter than the slender pedicel of the ovary. *Sepals* and *petals* sub-equal, broadly lanceolate, spreading. *Lip* adnate to the whole length of the column, broadly oblong, decurved, 3-lobed, the base with a didymous puberulous callus; the basal lobes short, erect, broad and rounded; the anterior lobe oblong, obtuse, the edges much undulate and the upper surface with a large fleshy callus divided into three ridges. *Column* short, thick, its anterior surface hispid. Lindl. Fol. Orch. 2; Walp. Ann. VI, 912; Hook. fil. Fl. Br. Ind. V, 848. *C. occidentalis*, Lindl. Fol. Orch. 3; Walp. Ann. l. c., 848.

Sikkim, in the Lachen Valley, at an elevation of 6,000 feet; Pantling No. 389. Westward along the Himalaya as far as Kashmir.

The petals and sepals externally are green, edged with white; internally they are of a pale yellowish-green. The lip is of the same colour, but the fleshy ridged callus on its upper surface is purple, as is also the anther. The plant described by Lindley as *C. occidentalis* agrees with this, except in having five ridges on the callus of the lip, instead of three.

PLATE 223.—*Calanthe tricarinata*, Lindl. Pseudo-bulbs, leaf and raceme; *of natural size*. Sketch of an entire plant; *much reduced*. Fig. 1 front view of a flower, 2 profile view of bract, stalked ovary, column and lip, 3 lip, 4 column and saccate base of lip, the anther having been removed, 5 inner view of anther; *all enlarged*.

3. CALANTHE PUBERULA, Lindl. in Wall. Cat., 7342; Gen. and Spec. Orch., 352.

Pseudo-bulb small, broadly ovoid with conical apex, about 1 in. in length. *Pseudo-stem* 2 to 4 in. long, sometimes shorter. *Leaves* 5 to 7, very unequal, the lower little more than a sheath; the upper elliptic or elliptic-oblong, acuminate, slightly narrowed to the broad loosely-sheathing base, 4 to 6 in. long and 1·75

to 2 in. broad. Peduncle and *raceme* much longer than the leaves; the peduncle with several scattered lanceolate acuminate *bracts*; the raceme 3 to 6 in. long, laxly-flowered, the rachis puberulous. Flowers puberulous externally, lavender-coloured, 1·2 in. across; *bract* lanceolate, acuminate, as long as or rather shorter than the stalked ovary. *Sepals* ovate-lanceolate, with broad bases, acuminate, spreading. *Petals* linear, acute, spreading, falcate. *Lip* adnate to the base of the column, oblong in general outline, shortly clawed, 3-lobed; basal lobes flat, falcately oblong, blunt, with two narrow calli on the disc between them, their apices pointing forward; terminal lobe without a callus, connected to the basal by a straight narrow isthmus, ovate-orbicular with a long apiculus, its edges coarsely erose. *Column* short, thick. *Anther* pointed. *Pollinia* 8, clavate, attached in fours to two caudicles and these to a triangular gland. *Capsule* narrowly elliptic, 1·25 in. long. Lindl. Fol. Orch. 2; Walp. Ann. VI, 912; Hook. fil. Fl. Br. Ind. V, 848. *Bletia* spec., Griff. Ic. Pl. Asiat., t. 313A.

Sikkim, at elevations of from 6,000 to 7,000 feet; in flower during July and August; Pantling, No. 181. Westward along the range to Simla and eastwards to Bhutan. Also in the Khasia Hills; Griffith (Kew Distrib.) No. 5274, Mann, Gammie. Naga Hills, Assam; Prain.

The flowers are of a beautiful, nearly uniform, pale lavender colour, the lip sometimes being of a deeper shade with a little white near the base; the column with much white on it, and with yellow and purple markings in front.

PLATE 224.—*Calanthe puberula*, Lindl. Pseudo-bulbs, leaves and inflorescence; *of natural size.* Fig. 1 lip, 2 apex of ovary, column with anther *in situ*, 3 pollinia; *all enlarged.*

4. CALANTHE MANNII, Hook. fil. Fl. Br. Ind. V. 850.

Pseudo-stem about 3 in. long, *pseudo-bulb* small. *Leaves* oblanceolate-oblong, tapering gradually into the long petiole, the apex acute, the lowermost one sheathed at the base; length of adult blade 9 or 10 in., breadth 1·5 to 2 in. Peduncle from amongst the young leaves, pubescent, about 9 in. long; the *raceme* half as long as the peduncle, few-flowered, lax. *Flowers* only ·3 in. long, deflexed after expansion; *floral bract* minute, lanceolate, shorter than the pedicel of the stalked ovary. *Sepals* sub-equal, connivent, pubescent externally, ovate-oblong, sub-acute, concave. *Petals* oblong, acute, not spreading. *Lip* slightly shorter than the sepals, shortly spurred, adhering to the column almost to its apex and forming with it a long sac, 3-lobed; basal lobes large, broad, truncate, erect; terminal lobe deflexed, subreniform, entire; upper surface with two tubercled ridges from the base to the middle of the anterior lobe and a third shorter one between them in their upper half. *Column* short, dilated towards the apex. *Anther* pointed. *Pollinia* unknown.

Sikkim, at Rungbee, elevation 6,000 feet; Lachen Valley, 7,000 feet; Pantling, No. 311. Western Himalaya; below Ranikhet in Kumaon, J. F. Duthie. Khasia Hills; alt. 4,000 feet, C. B. Clarke, Rita.

The colour of the flowers is dull brown. This is a self-fertile species. Mr. Pantling was unable to obtain pollinia for figuring, as in all the flowers of the only living specimen found by him, they had been more or less absorbed by the stigmas, the clinandrium having apparently become absorbed.

PLATE 225.—*Calanthe Mannii*, Hook. fil. A plant; *of natural size.* Fig. 1 a flower, side view, 2 lip, 3 bract, stalked ovary, column and lip, side view, 4 section through column and spur, 5 column and spur, 6 anther; *all enlarged.*

5. CALANTHE TRULLIFORMIS, King and Pantling in Journ. As. Soc. Beng. LXIV, Pt. 2, p. 337.

Pseudo-stem short; *pseudo-bulbs* oblong, only ·5 in. long. *Leaves* linear-lanceolate, acute, sessile, 9 to 12 in. long. *Raceme* about 9 in. long; its peduncle about the same length, puberulous. *Flowers* 12 to 18, scattered, about 1 in. in diam; *floral bract* linear-lanceolate, equal to or exceeding the stalked puberulous ovary. Dorsal *sepal* ovate-lanceolate, acuminate, ·75 in. long; the lateral pair lanceolate, falcate, longer than the dorsal. *Petals* linear-lanceolate, acute, shorter than the lateral sepals. *Lip* adnate to the whole length of the column, with a short thick claw and a short cylindric spur, trowel-shaped, the base entire, the sides irregularly crenate-dentate, the apex acuminate, entire; the upper surface with two converging lamellæ extending from its base midway to the apex. *Spur* short, stout, its mouth triangular, its interior bristly. *Pollinia* 8, unequal, clavate, in four unequal pairs.

Sikkim, on Mahaldaram Peak, elevation 6,000 feet; flowering in July; Pantling, No. 168.

A species allied to *C. puberula*, Lindl., but differing from that plant in having sessile leaves and a lip without side lobes. The colour of the sepals and petals is brown, with mesial and marginal green lines. The lip is white, with a triangular pink mark at the base.

PLATE 226.—*Calanthe trulliformis*, King and Pantling. A plant; *of natural size.* Fig. 1 a flower, 2 bract, stalked ovary, column and lip, 3 lip, 4 column with anther *in situ* and the entrance to the spur, 5 anther, 6 pollinia; *all enlarged.*

6. CALANTHE BREVICORNU, Lindl. in Wall. Cat., 7338; Gen. and Spec. Orch., 251.

Pseudo-bulbs small, ovoid, pointed, 1 in. long. *Pseudo-stem* 2 to 4 in., stout, with wide sheaths. *Leaves* usually 3, sub-equal, oblong-elliptic, shortly acuminate, slightly tapered to the wide sheathing base, when adult petiolate; length of blade 9 to 12 in., breadth 2·5 to 3·5 in., petiole 4 to 8 in. Peduncle and *raceme* longer than the leaves; the peduncle with a few scattered short bracts; the raceme 12 in. long, laxly flowered, the rachis, ovaries and outside of the sepals puberulous. *Flowers* 1·5 to 1·75 in. across; *floral bract* narrowly lanceolate, half as long as the stalked ovary. *Sepals* sub-equal, oblong-lanceolate, all acute and spreading. *Petals* shorter than the sepals, lanceolate. *Lip* attached to the lower half of the column, with a short, broad, blunt, straight spur, 3-lobed; the basal lobes oblong, blunt, diverging; the apical lobe sub-obovate with a broad emarginate apiculate apex and irregularly toothed edges, contracted at its junction with the basal lobes; the upper surface with three tubercled fleshy lamellæ running from the base and increasing in height to near the apex. *Column* short. *Anther* beaked. *Pollinia* 8, clavate, attached to a common pedicel and gland. *Capsule* ellipsoid, about 1 in. long. Lindl. Sert. Orch., t. 9; Fol. Orch., 3; Walp. Ann. VI, 912; Hook. fil. Fl. Br. Ind. V, 848.

Sikkim, at elevations of 6,000 to 8,000 feet; in flower during May and June; Griffith (Kew Distrib.), No. 5278; Pantling, No. 317. Nepal; Wallich. Kamaon; T. Anderson. Bhutan; King's collector.

The colour of the flowers is dull purple or brick red, relieved by lines of white on the midribs of the sepals and petals and on the edges of the lip; while the lamellæ of the lip have streaks of yellow on them. The outer surfaces of the parts of the flower are all strongly flushed with white. A colour variety is occasionally found in which the dull purple of the perianth gives place to yellow, there being no difference structurally and both forms sometimes occurring on the same plant. The mouth of the short spur is lined with retroflexed hairs.

PLATE 227.—*Calanthe brevicornu*, Lindl. Leaf and raceme; *of natural size*; outline of a plant; *much reduced in size*. Fig. 1 lip, 2 bract, stalked ovary, column and lip, 3 section through apex of ovary, column and lip, 4 column with the anther undisturbed, 5 anther, 6 pollinia; *all enlarged*.

7. CALANTHE BILOBA, Lindl. Fol. Orch., 3.

Pseudo-bulbs stout, cylindric, stem-like, 6 to 8 in. long. *Leaves* several towards the apex of the pseudo-stem, unequal, the lower short and sheath-like, broadly elliptic, shortly caudate-acuminate, undulate, tapering to the broad sheathing petiole; length of blade of upper leaf 8 to 12 in., breadth 2·5 to 4 in. *Racemes* 1 or 2 from the axils of the lowest leaves, measuring with their long peduncles 18 to 30 in. in length (the raceme forming one-third), minutely puberulous. *Flower* 1·5 in. across (vertically); *floral bract* lanceolate, acuminate, shorter than the stalked ovary, the lower *bracts* longer than the upper. *Sepals* sub-equal, spreading, broadly ovate-lanceolate, caudate-acuminate; the lateral pair falcate, rather narrower than the dorsal. *Petals* shorter and narrower than the sepals, oblong, with somewhat expanded triangular apices. *Lip* longer than the sepals, with a short conical spur and a long narrow claw; its lamina broadly ovate-oblong, deeply 2-lobed; the lobes sub-rhomboid, acute, deflexed, their margins slightly undulate; the sinus narrow with an acute apiculus; the upper surface with three shallow ridges towards the base. *Column* short, stout. *Anther* apiculate. *Pollinia* 8, unequal, narrowly oblong, attached by long stalks to a small transparent elliptic gland. Walp. Ann. VI, 912; Hook. fil. Fl. Br. Ind. V, 848.

Sikkim, rather common in shady places, at elevations of from 3,500 to 7,000 feet; Pantling, No. 56. Also in East Nepal; Sir J. D. Hooker; in flower during September and October.

The ovary and anterior portion of the lip of this are usually pale violet, the claw of the lip being whitish. The whole of the sepals and the petals, except their triangular apices, are ochraceous yellow beautifully mottled with purplish-brown; the column is tipped with dark brown, and the spur is pink. This colouration is, however, not constant. The wide mouth of the spur is lined with hairs which point downward. The raceme here figured is in a far-advanced stage; while young, the raceme is much more condensed and is pyramidal with a drooping apex. In this species the limits of the three stigmas which are united in the column and rostellum are marked by faint lines.

PLATE 228.—*Calanthe biloba*, Lindl. Blade of a leaf and a raceme; *of natural size*; outline of an entire plant; *much reduced*. Fig. 1 a flower, 2 bract, ovary, column with anther *in situ*, and lower part of lip with spur, 3 section of the foregoing, 4 anther, 5 pollinia; *all enlarged*.

8. Calanthe alpina, Hook. fil. in Lindl. Fol. Orch., 4.

Pseudo-bulbs sub-cylindric, tapering at the ends, with two or three annular markings. *Pseudo-stem* very short. *Leaves* unequal, the lower sheath-like, oblanceolate, sub-acute, tapering to the short petiole; length of blade of adult leaf 6 or 7 in., breadth 1·4 to 1·8 in.; petiole 1 to 1·5, (not developed in the younger leaves). Peduncle and raceme together longer than the leaves. *Raceme* 4- or 5-flowered, glabrous. *Flowers* (to the tip of the spur) ·75 in. across; *floral bract* lanceolate, half as long as the stalked ovary. *Sepals* sub-equal, ovate-oblong, acuminate, concave. *Petals* elliptic-lanceolate, sub-connivent, shorter than the sepals. *Lip* shorter than the sepals, with a cylindric spur nearly as long as the ovary, joined to the column about the middle, without lateral lobes, the lamina semi-orbicular, its edges deeply incised-fimbriate. *Column* short, broadly-winged, the margin toothed; *anther* with a small truncate lip; *pollinia* 8, clavate, attached in fours to two caudicles inserted on an ovate gland. Walp. Ann. VI, 913; Hook. fil. Fl. Br. Ind. V, 850.

Sikkim; in the Lachen Valley, at elevations of 6,000 to 10,000 feet; Sir J. D. Hooker; Pantling, No. 388; in flower during July and August.

The sepals and petals are white tipped with green; the lamina of the lip is dull red, its base and the spur being pale yellowish.

Plate 229.—*Calanthe alpina*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 bract, ovary, column and lip with its spur, seen from the side, 3 lamina of lip, 4 apex of ovary, column and anther, 5 anther, 6 pollinia; *all enlarged*.

9. Calanthe alismæfolia, Lindl. Fol. Orch., 8.

Pseudo-bulbs thin, cylindric, tapering to the apex, with several annular rings, somewhat curved, 1 to 2 in. long. *Leaves* broadly elliptic, shortly acuminate, rather abruptly narrowed at the base into a very long channelled petiole, the edges undulate; length 5 to 7 in., breadth 2·25 to 3 in. *Scape* about as long as the leaves, with a few distant sheathing *bracts*; the raceme corymbose and only 1 to 2 in. long, puberulous. *Flowers* ·8 in. across (vertically); *floral bract* large, cordate, acuminate, shorter than the shortly-stalked ovary. *Sepals* sub-equal, sub-orbicular, erecto-patent, externally with short coarse purple hairs. *Petals* sub-rhomboidal, about as large as the sepals, sub-acute. *Lip* obovate, adnate by its base to the column for quite the whole length of the latter, 3-lobed; the basal lobes narrowly oblong-oblanceolate, obtuse, somewhat falcate, blunt, resting on the terminal lobe and pointing forwards; the terminal lobe broad with a large lobulate yellow callus at its base; the apex bilobulate, the lobules broad, rounded, and with crenulate edges, the sinus deep and apiculate at the bottom; the spur constricted at the neck, long, cylindric, blunt, nearly as long as the ovary and lying parallel to it. *Column* very short, with the callosities of the lip closely applied to it. *Anther* acuminate. *Pollinia* 8, clavate, attached directly (without a caudicle) to an ovate, acute gland; stigma divided into two halves by the entrance to the spur. *Capsule* narrowly elliptic, ·75 to 1 in. long. Walp. Ann. VI, 918; Hook. fil. Fl. Br. Ind. V, 849.

Sikkim; in the Terai and near the bottoms of valleys up to 2,000 feet; in flower during May and June; Pantling, No. 316. Gharwal; Falconer (Kew Distrib.), Nos. 1055, 1056. Khasia Hills; Hooker fil. and Thomson.

The prevailing colour in the flowers is white; but the sepals are tipped with green externally, and the lip has a blotch of pale violet near the base, the large lobulate callosity however being bright yellow.

PLATE 230.—*Calanthe alismæfolia*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, in profile; 3 section through apex of ovary, stigma (*s*), column and lip, 4 front view of the column showing the callosity and the base of the lip, the entrance to the spur (*e*), and the stigma (*s-s.*), 5 anther, 6 pollinia; *all enlarged*.

10. CALANTHE ANGUSTA, Lindl. Fol. Orch., 7.

Pseudo-bulbs coespitose, conical, only ·5 in. long. *Leaves* from the pseudo-bulbs, narrowly elliptic, acute, tapering to the sessile base; length 6 to 9 in., breadth 2 to 3 in. Peduncle and *raceme* together 15 to 24 in. long; the peduncle stout, puberulous, bearing several lanceolate sheathing *bracts* 1 to 2 in. long; the raceme 4 to 6 in. long, many-flowered. *Flowers* 1 in. across, white; *floral bract* broadly elliptic, acute or sub-acuminate, rather shorter than the slenderly stalked ovary. *Sepals* elliptic, sub-acute, spreading. *Petals* narrowly oblong, blunt, only one-half the width of the sepals. *Lip* spurred, longer than the sepals, adnate to the column throughout the entire length of the latter; side lobes large, oblong, sub-falcate, their apices converging and overlapping the base of the apical lobe, sub-acute; apical lobe sub-reniform, its apex with two large sub-obovate blunt lobules separated by a deep triangular sinus; the upper surface bearing a cluster of small yellow calli between the bases of the side lobes and in front of the mouth of the spur. *Spur* slender, long, cylindric, slightly curved, puberulous, nearly as long as the stalked ovary. *Column* short; stigma divided into two elongated halves by the entrance to the spur; arms of the rostellum oblong, blunt and projecting beyond the lip of the anther. *Pollinia* shrunken, attached to a quadrate gland. Walp. Ann. VI, 916; Hook. fil. Fl. Br. Ind. V, 849.

At the base of the range to the east of the Jaldacca river, at an elevation of about 800 feet; in flower during April; Pantling, No. 440. Khasia Hills; Lobb, Clarke. Manipur; alt. 3,500 feet, Watt.

The flowers, which are pure white and have a sweet smell, resemble those of *C. odora*, Griff., although the latter have a spur longer than the ovary, and the flowers and leaves are not contemporaneous as in this. The specimens of *C. odora* are very scanty, but an examination of them leads us to believe that *C. odora* and *C. angusta* are probably only different names for the same species.

PLATE 232.—*Calanthe angusta*, Lindl. A plant; *of natural size*. Fig. 1 a flower; 2 floral bract, stalked ovary, column and lip with its spur, side view, 3 lip, 4 column with the anther *in situ*, rostellum (*r*), entrance to the spur (*e*) and stigma (*s*), 5 empty anther, 6 pollinia; *all enlarged*.

11. CALANTHE CHLOROLEUCA, Lindl. Fol. Orch., 10.

Pseudo-bulbs ovoid, annulated, about 1 in. long, on a stout rhizome. *Leaves* 2, elliptic-lanceolate, acute, gradually tapering to the broad sheathing petiole, not fully developed until after the flowering; length when adult 12 to 14 in., breadth 2·75 to 4·5 in., petiole about 3 to 6 in. Peduncle longer than the leaves, puberulous,

bearing one or two ovate sheaths. *Raceme* about 12 in. long, sparsely-flowered; *bract* about ·25 in. long, membranous, much shorter than the stalked ovary. *Flowers* 1·75 in. across (vertically); the spur stout, about as long as the sepals and much shorter than the pubescent ovary, slightly curved, cylindro-conic. *Sepals* ovate-lanceolate, acuminate. *Petals* oblanceolate, acuminate, all spreading or sub-reflexed. *Lip* adnate to the column to near the apex of the latter, longer than the sepals; basal lobes broadly oblong, divergent; the mouth of the spur with twin calli; apical lobe broad, divided by a narrow sinus into two broad rounded lobules with minutely erose edges. *Pollinia* attached in two groups of four to two caudicles, the gland elliptic. *Column* short, broad. Walp. Ann. VI, 920; Hook. fil. Fl. Br. Ind. V, 852; in Ann. Bot. Gard. Calc. V, 31, t. 45. *C. galeata*, Lindl. Fol. Orch., 5; Walp. Ann. VI, 914.

Sikkim, altitude 6,000 to 8,000 feet; Sir J. D. Hooker; Pantling No. 468, in flower during April and May.

This is closely allied to *C. herbacea*, Lindl., but differs in the manner noted under that species. The sepals and petals of this are of a yellowish-green and the lip white with an elongated patch of yellow along its middle. The flowers have the perfume of primroses.

PLATE 231.—*Calanthe choloroleuca*, Lindl. A plant; *of natural size*. Fig. 1 front view of a flower, 2 side view of bract, stalked ovary, column with anther *in situ* and lip, 3 lip showing the apical and basal lobes, 4 side view of column with anther in position, and of the lip, 5 anther, 6 pollinia; *all enlarged*.

12. CALANTHE HERBACEA, Lindl. Fol. Orch., 10.

Pseudo-bulbs short, bluntly fusiform, broadly annular, slightly curved, ·75 to 1·25 in. long. *Leaves* broadly or narrowly elliptic, shortly caudate-acuminate, tapering to the petiolate base; length 6 to 10 in., breadth 2 to 4 in., petiole 2 to 6 in. long. Peduncle from amongst the leaves and nearly twice as long, stout, with one or two lanceolate acuminate *bracts* ·5 to 1 in. long; the *raceme* lax, about 6 in. long, with about 15 flowers, glaucous. *Flowers* 1·5 in. in expanse from base to apex; the *floral bract* lanceolate, about half as long as the ovary. *Sepals* elliptic, sub-acute, the dorsal one rather obovate-elliptic, all spreading. *Petals* narrower than the sepals, sub-spathulate, reflexed. *Lip* longer than the sepals, attached to the whole length of the column, and having a warted triangular callus at the base; side lobes narrowly oblong, directed outwards; terminal lobe broadly triangular, deeply emarginate at the apex; the lobules diverging, oblong, falcate, the sinus wide with a small apiculus; the slender sigmoid spur nearly equal in length to the pedicelled ovary. *Column* rather long, forming with the base of the lip a cylindric tube. *Anther* pointed. *Stigma* divided into two segments by the entrance to the spur. *Pollinia* sub-equal, elongate, clavate, attached to an elliptic gland. Hook. fil. Fl. Br. Ind. V, 852; in Ann. Roy. Bot. Gard., Calc., V, 30, t. 44.

Sikkim, at elevations of from 4,000 to 6,000 feet; Hooker fil., King; Pantling, at Rungbee, 6,000 feet, No. 80; in flower during June.

The sepals and petals are green, and the lip pure white except its callus which is yellow. The upper halves of the sepals and petals are sometimes ochreous yellow,

the lower halves being green. This species is very closely allied to *C. chloroleuca*, Lindl., but differs from it in having fewer flowers in its raceme, somewhat larger floral bracts, and a much longer spur. Moreover in this the apical lobuli of the lip are entire, narrowly oblong and diverging; while in *C. chloroleuca* these lobuli are crenate, broad, rounded, and not diverging. The flowers of this are inodorous, while those of *C. chlorantha* are delightfully fragrant.

PLATE 233.—*Calanthe herbacea*, Lindl. Pseudo-bulbs, leaf and raceme; *of natural size*. Fig. 1 a flower, 2 column and base of lip, stigma (*s*) and entrance to spur (*e*), 3 section of column and spur, one-half of the stigma (*s*) (not in section), 4 anther, 5 pollinia; *all enlarged*.

13. CALANTHE MASUCA, Lindl. in Wall. Cat. 7337; Gen. and Spec. Orch., 249.

Pseudo-bulbs narrowly conical, with annular scars, 2 to 3 in. in length. *Leaves* more or less broadly elliptic, acute, narrowed at the base into a petiole, or sessile; length 6 to 15 in., breadth 2·75 to 4·25 in.; petiole 2 to 6 in., or 0. Peduncle exceeding the leaves in length, stout, with two or three scattered acute lanceolate *bracts*. *Raceme* about 6 in. long, many-flowered, pubescent. *Flowers* rather crowded, depressed, 2 in. across, with a curved slender cylindric spur longer than the ovary; *bract* ovate-lanceolate, concave, shorter than the puberulous stalked ovary. *Sepals* elliptic or elliptic-lanceolate, acute, spreading, the lateral pair slightly longer than the dorsal. *Petals* smaller than the sepals, sub-acute. *Lip* as long as the sepals, attached to almost the whole length of the column, 3-lobed; the basal lobes oblong, blunt, sub-falcate, directed forwards; apical lobe large, sub-rhomboid, or cuneately reniform, deeply emarginate at the apex; the disc between the side lobes with three unequal elongate tubercular calli. *Column* very short. *Stigma* in two halves and the rostellum consisting of two projecting plates. *Anther* pointed. *Pollinia* 8, sub-equal, clavate, sub-sessile on a small oblong gland. *Capsule* elliptic, 1·5 in. long. Lindl. in Bot. Reg., 1842, Misc., 51; id. 1844, t. 37; Fol. Orch., 6; Bot. Mag., t. 4541; Paxt. Fl. Gard. I, 138; Walp. Ann. VI, 915. *C. versicolor*, Lindl. Sert. Orch., t. 42; Bot. Reg., 1844, sub. t. 37; Fol. Orch., 6. *C. emarginata*, Wight Ic., 918; ? Lindl., Gen. and Spec. Orch., 249; Fol. Orch., 5. *C. Wightii*, Reichb. fil. in Walp. Ann. VI, 932. ? *Amblyglottis emarginata*, Blume Bijdr., 370. *Bletia Masuca*, Don Prodr., 30. *Loduba Masuca, Herb. Ham.*

Sikkim, common at elevations from 1,500 to 4,000 feet; in flower during August and September; Pantling, No. 39. Distributed westward along the range to Nepal; also in the high lands of the Deccan, the Western Ghats and in Java.

The flowers are of an almost uniform violet tint, becoming of a rusty colour when beginning to wither. The calli on the lip are yellow. The coloration, however varies. In the form which was named *C. versicolor* the perianth is white, the lip being purple, changing to yellow. In another form the sepals are crimson and the lip deep purple. The latter variety does not, however, occur in Sikkim.

PLATE 234.—*Calanthe Masuca*, Lindl. Stems, leaf and raceme; *of natural size*. Two entire plants *much reduced*. Fig. 1 a flower, 2 bract, ovary, column, spur and lip, in profile, 3 lip, 4 the column showing the stigma (*s*), rostellum (*r*), and entrance to the spur (*c*) between the two halves of the, stigma, 5 anther, 6 pollinia; *all enlarged*.

14. Calanthe Whiteana, King and Pantling in Journ. As. Soc. Beng. LXV, pt. 2, 121.

Pseudo-bulbs only 1·5 in. long, conical, with annular scars. *Leaves* linear-lanceolate, acuminate, much narrowed towards the sessile base, 2 to 3 feet long and 1·5 in broad at the widest part. *Scape* stout, together with the densely-flowered raceme 2 to 4 feet long, puberulous and with a few short scattered sheaths. *Flowers* ·75 to 1 in. across, yellowish; *floral bract* 1 in. or more in length, linear, acuminate, deflexed, longer than the ovaries. *Sepals* ·4 in. long, ovate, blunt, 3- to 5-nerved, reflexed and resting upon the stalked ovary. *Petals* elliptic-lanceolate, acute, narrowed towards the base, erect. *Lip* very short, sessile, adnate to the whole length of the column; the lamina transversely elliptic or quadrate, without lateral lobes, its apex bilobulate; the lobules reflexed, their margins entire or sub-crenate; the upper surface with five papillate ridges running along the centre from base to apex. *Column* short, stout; stigmatic surfaces double, one on each side of the entrance to the spur. Spur exceeding the stalked ovary, sub-clavate, slightly curved, sparsely pubescent, the inner wall with hair-like papillæ in its upper half. *Pollinia* 8, unequal, in groups of four, sub-sessile on an oblong gland derived from the stigma.

Sikkim, at Choongthang, elevation 6,000 feet; in flower during May; Pantling, No. 365.

This species comes nearest to *C. Mannii*, Hook. fil., which has, however, a very short spur. This is as yet a little-known plant, only a few specimens having hitherto been gathered. The flowers are sweet-scented. The lip is of a bright yellow and the column is nearly white, the other parts of the flower being yellowish-green. We have named it after Mr. Claude White, Political Agent in Sikkim, who has given us much help in obtaining botanical specimens from Independent Sikkim.

Plate 235.—*Calanthe Whiteana*, King and Pantling. A leaf and a raceme; *of natural size.* Entire plant; *reduced in size.* Fig. 1 a flower, 2 bract, ovary and flower, side view, so as to show the spur, 3 column seen from the front with the stigma (*s*), 4 section of apex of ovary, column, anther and spur, the stigma marked (*s*), 5 anther, 6 pollinia; *all enlarged.*

15. Calanthe densiflora, Lindl. in Wall Cat., 7344; Gen. and Spec. Orch., 250.

Rhizome consisting of jointed fusiform annular lengths about 2 in. long, each producing at its thick end a pseudo-stem and flowering scape. *Stem* very short. *Leaves* about three, narrowly elliptic, acute, tapering at the base to the short broad sheathing petiole; length 2 to 3 feet, breadth 3 to 5 in., petiole 2 to 6 in., sometimes absent. *Scape* from the rhizome behind the stem, 4 to 12 in. long, erect, stout, bearing three or four broad tubular acute inflated sheaths 1 in. or more in length. *Raceme* 2·5 to 3 in. long, at first sub-globose, afterwards cylindrical, densely-flowered, sometimes branching. *Flower* (to the end of the spur) ·8 in. long, and in diam. ·5 in.; *bract* thin, elliptic, acute, conduplicate, longer than the abruptly stalked ovary, the *bracts* of the lowest flowers often much longer. *Spur* nearly as long as the ovary and its pedicel, cylindric, slightly inflated towards the apex. *Sepals* and *petals* connivent, sub-equal, oblanceolate, acute. *Lip* adnate to the column from its middle; the basal lobes large, sub-triangular, erect, and with two large semi-erect rounded lamellæ between them; apical lobe quadrate,

emarginate, the sinus broad, shallow. *Column* straight, thick at the base only, shorter than the spur. *Stigma* rounded, entire. *Anther* with a short oblong transparent lip. *Pollinia* sub-equal, globose-clavate, attached by a single caudicle to a small gland. Lindl. in Bot. Reg., t. 1646; Fol. Orch., 9; Walp. Ann. VI, 919; Hook. fil. Fl. Br. Ind. V, 855. *C. clavata*, Lindl. in Wall. Cat., 7343; Gen. and Spec. Orch., 251; Fol. Orch., 5; Hook. fil. Fl. Br. Ind. V, 854.

Bhutan, in the Naru Valley, at an elevation of 3,000 feet; in flower during October; Pantling, No. 351; collected also by Treutler and others. Khasia Hills; alt. 4,000 to 5,000 feet.

The flowers are yellow throughout. Prior to their expansion the raceme is covered by thin deciduous bracts. We can find no difference between this and *C. clavata*, Lindl., and have therefore reduced the latter, as being described by Lindley on a later page of his genera and species of Orchids.

PLATE 236.—*Calanthe densiflora*, Lindl. Plant; *of natural size*. Fig. 1 a flower, side view, 2 bract, stalked ovary, column, lip and spur, side view, 3 section of the foregoing (except the bract), 4 lip, 5 column with anther *in situ*, 6 anther, 7 pollinia; *all enlarged*.

33. Yoania, Maximowicz.

Saprophytic aphyllous succulent herbs with stout branched rootless rhizomes. *Stem* 2 to 4 in. high, erect, stout, bearing a few short fleshy *bracts* and, at its apex, four or five long-stalked flowers nearly 1 in. long in a short lax raceme. *Sepals* and *petals* short, concave, the former fleshy. *Lip* about as long as the sepals and petals, sessile on the short foot of the column, somewhat slipper-shaped, the margins of the anterior half approximated so as to convert the posterior half into an open sac; spurred or not. *Stigma* transverse, concave. *Column* stout, broad, with a tooth at the apex on each side of the anther, the margin winged. *Pollinia* 2, bi-partite, waxy, sessile on a large quadrate gland resembling that of *Cymbidium*. Distrib., two species, Japanese and Indian.

YOANIA PRAINII, *new species*.

Rhizome densely clothed with small imbricating narrowly lanceolate acuminate adpressed scales. *Stem* smooth; its two or three bracts ·4 to ·6 in. long, loose. *Flowers* about 1 in. long; *floral bract* ·5 in. long, ovate, fleshy, the ovary and its stalk varying in length from 1 to 2 in. *Sepals* ovate-lanceolate, sub-acute. *Petals* of thinner texture than the sepals, ovate-rotund, very obtuse, entire, and with five parallel non-converging nerves. *Lip* with entire edges, not spurred. *Anther* anticous, broad, dome-shaped, beaked. *Capsule* 2 to 2·5 in. long, narrowly fusiform, boldly ridged, erect, on a stout stalk. *Y. japonica*, Benth. in Hook. Ic. Plantar., t. 1364; Hook. fil. in Fl. Br. Ind. VII, 123 (*but not of Maximowicz and Finet*).

Sikkim-Himalaya, at Choongthang, elevation 6,000 feet; Pantling, No. 469. Naga Hills; elevation about 7,000 feet, Prain, No. 15.

This species differs from *Y. japonica* of Maximowicz, as originally described by that author in the Bulletin of the St. Petersburg Academy (Vol. XVIII, p. 68), and more recently described and figured by M. Finet in the Bulletin Soc. Bot. de France, Vol. XIV, 601, t. XII. In the present species the lip has entire edges; it has no spur and no processes on any part of its upper surface; in *Y. japonica* the edges of the lip are serrate, and there is curious blunt spur directed forwards and bearing

a small carunculate process in its interior. The petals of the plant here described are almost rotund and quite entire, while in *Y. japonica* they are oblong with broad oblique serrate apices. The Japanese species moreover has more slender stems than *Y. Prainii*, with longer flower-pedicels and a stouter rhizome sparsely clothed with larger scales. In the present species the flowers are white throughout.

PLATE 237.—*Yoania Prainii*, King and Pantling. A plant; *of natural size.* Fig. 1 a flower, 2 apex of ovary, column (the anther having been removed) and lip, 3 petals, 4 lip seen from above, 5 front view of the column (the anther absent) showing the pollinia *in situ*, 6 pollinia and gland: *all enlarged* and *all from a Sikkim specimen*; 7 much enlarged view of a flower with the anther in position, *from one of Dr. Prain's Naga Hill specimens.*

34. Eulophia, R. Brown.

Terrestrial glabrous herbs with fleshy tubers or rhizomes, rarely pseudo-bulbous. *Leaves* appearing along with or after the flowers, long, narrow, usually plicate (probably sometimes absent). *Scape* usually lateral, erect, tall, sheathed, bearing a raceme (rarely a panicle). *Sepals* and *petals* free, spreading, often sub-equal. *Lip* adnate to the base of the column or to its foot, base saccate or with a short spur, usually 3-lobed; the lateral lobes erect and embracing the column; disc usually ridged or crested. *Column* with or without a foot, its apex entire and often oblique, its margins sometimes winged or lobed. *Anther* terminal, sometimes with two apical processes, its lip often toothed, 2-celled. *Pollinia* 2, globose, attached by a caudicle to the flat gland of the rostellum. Species about 100, chiefly Asiatic; all tropical.

Column with no foot or with a very short one—
- Inflorescence branched . . . . . 1. *E. graminea.*
- Inflorescence not branched—
  - Spur of lip wide, conical . . . . . 2. *E. Mannii.*
  - Spur of lip short, geniculate . . . . . 3. *E. geniculata.*
  - Spur of lip short, straight, cylindric . . . . . 4. *E. campestris.*

Column with a long foot—
- Petals obovate, floral bract strongly deflexed . . . . . 5. *E. sanguinea.*
- Petals oblong or ovate-oblong—
  - Lip without side lobes, its upper surface with about nine faint vertical lines . . . . . 6. *E. nuda.*
  - Lip with side lobes; the upper surface with two lines below the middle, each ending in a free tooth, and above the middle with five carunculate ridges . . . . . 7. *E. bicarinata.*

NOTE.—Two species of *Eulophia* attributed in the Flora of British India to Sikkim, and one attributed to Bhutan, have never been found by us and are therefore not described here. These are—

No. 14. *E. stenopetala*, Lindl. Said to have been collected by Griffith in Bhutan.

No. 16. *E. densiflora*, Lindl. Collected at the foot of the Sikkim range by Sir J. D. Hooker, and in Bhutan by Griffith.

No. 21. *E. candida*, Hook. fil. Collected at the base of the Sikkim-Himalaya by Sir J. D. Hooker.

1. EULOPHIA GRAMINEA, Lindl. in Wall. Cat., 7372; Gen. and Spec. Orch., 182.

Pseudo-bulb obpyriform, 1 to 4 in. long, epigæal. *Leaves* persistent, linear, acute, sheathing at the base, 8 to 14 in. long and 4 to 5 in. broad. *Scape* from the side of the

pseudo-bulb, branched, longer than the leaves (often measuring as much as 30 in.), with several broad-based, acuminate sheaths near the base and others scattered in the upper part. *Flowers* distant, ·75 in. across; *floral bract* lanceolate, shorter than the stalked ovary. *Sepals* and *petals* sub-equal, oblanceolate, acute, spreading; the petals a little broader than the sepals, the venation in all netted. *Lip* equal in length to the sepals and petals but broader, oblong-oblanceolate in general outline; the side lobes narrow, with blunt apices, pointing forwards; apical lobe sub-rotund, undulate, but not lobed; the upper surface with five ridges extending from base to apex, the edges entire between the side lobes but fimbriate on the apical lobe. *Spur* short, wide, bulbous. *Column* straight, without wings or foot. *Anther* with two bosses in front. *Pollinia* sub-quadrate, the caudicle short and the gland small. Lindl. in Journ. Linn. Soc. III, 23; Hook. fil. Fl. Br. Ind. VI, 2. *E. inconspicua*, Griff. Notul., 349; Ic. Plant. Asiat., t. 326; Lindl. in Journ. Linn. Soc. III, 24.

Sikkim, at the foot of the range; flowering in March, common; Pantling, No. 438. Assam, Plains of Bengal, Travancore, Ceylon; also in Tenasserim, the Nicobar Islands, Malacca and Singapore.

The sepals and petals are green with reddish nerves, the lip white with red on the ridges; they are not plicate. The short spur is slightly dilated at the apex. The leaves of the previous year are present in a withered condition at the time of flowering.

PLATE 238.—*Eulophia graminea*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column and lip, *seen from the side*, 3 lip, 4 apex of ovary, column with the anther *in situ*, and the spur, 5 anther, 6 pollinia; *all enlarged*.

2. EULOPHIA MANNII, Hook. fil. Ic. Plantar., t. 2115; Fl. Br. Ind. VI, 4.

Height of entire plant 4 to 7 feet, the leaves and inflorescence rising from an oblong flattened tuber about 3 or 4 in. long. *Pseudo-stem* formed by the sheaths enclosing the bases of the leaves and scape, 2 to 3 feet long and 1 in. thick at the base, and with long acuminate sheaths. *Leaves* about three, linear, acuminate, much narrowed at the base, 1 to 3·5 feet long and 1 to 2 in. broad. *Scape* 3 to 5 feet long, bearing four or five tightly-clasping sheaths each about 1 foot long. *Raceme* 12 in. long, lax. *Flowers* about 1 in. across, deflexed, yellow; *floral bract* lanceolate, about half as long as the slender stalked ovary. *Sepals* equal, oblanceolate, acute; the lateral pair inserted on the column and quite free from the sac of the lip. *Petals* broadly obovate, blunt. *Lip* conically saccate at the base, as long as the sepals, oblong, 3-lobed; the side lobes large, erect, rounded; the apical lobe orbicular, crenate-undulate; the disc between the side lobes with seven to nine more or less thickened nerves which unite to form a large carunculate callus on the apical lobe. *Column* rather broad, narrowly winged, the foot very short. *Anther* beaked at the base below its apex and with a single projecting process on its summit. *Pollinia* 2, globular, attached by a cylindric caudicle to a triangular gland.

Sikkim, in tropical valleys; in flower during July and August; Pantling, No. 457. Upper Assam; G. Mann.

The prevailing colour of the parts of the flower is yellow, but the petals are streaked with dull brown on the inner surface. This is the tallest growing *Eulophia* in Sikkim,

although, strange to say, it has not hitherto been recorded from the Province. The base of the lip forms a wide conical sac. There is no true mentum, the lateral sepals being attached to the column.

PLATE 239.—*Eulophia Mannii*, Hook. fil. A tuber, part of pseudo-stem, and raceme; *of natural size.* Sketch of entire plant; *much reduced.* Fig. 1 sepals and petals shown apart, 2 floral bract, ovary, column and lip, seen from the side, 3 lip, 4 column with its short foot, anther *in situ* and stigma, 5 view of lower surface and interior of anther, 6 pollinia; *all enlarged.*

3. EULOPHIA GENICULATA, King and Pantling in Journ. As. Soc. Beng. LXIV, Pt. II, 327.

Tuber large, oblong-rotund. *Leaves* about three and a half feet in length, of which the petiole forms one-third; the blade narrowly elliptic, acute, plicate. Flowering *scape* about 18 in. long, clothed throughout with sheathing bracts 1 to 3 in. long, and bearing at its apex a 6- to 8-flowered raceme. *Flowers* 1 in. in diam.; *floral bract* lanceolate, acute, equalling the cylindric ovary. Dorsal *sepal* elliptic, blunt; the two lateral elliptic-lanceolate, sub-acute. *Petals* broadly oblong, blunt, shorter than the sepals, connivent over the column. *Column* rather broad, with no foot. *Lip* oblong, with long shallow side lobes, its body with three to five parallel thickened nerves which end beyond the extremities of the side lobes in a carunculate area on the truncate apical lobe; the base with a short geniculate spur. *Anther* small, bicornute at the apex, the lip 2-toothed.

Sikkim, in the valley of the Teesta, elevation about 1,000 feet; flowering in August.

The sepals of this are brown, the petals and lip pale yellow. The petioles of the two leaves form a pseudo-stem rather shorter than the scape, and they are enclosed within two sheaths about 9 in. long. This pseudo-stem is bound to the scape near its base by two short broad sheaths which originate from the tuber. The nearest ally of the species is *E. lachnocheila*, Hook. fil.

PLATE 240.—*Eulophia geniculata*, King and Pantling. Parts of a plant, *of natural size.* Entire plant; *reduced in size.* Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ* and lip, 3 lip, 4 front view of column showing the anther, the stigma and the basal spur, 5 anther, 6 pollinia; *all enlarged.*

4. EULOPHIA CAMPESTRIS, Wall., Cat. 7617.

Tuber irregularly oblong, lobed, horizontal. *Leaves* absent at flowering-time, two, linear, acuminate, plicate, 10 to 16 in. long, and ·4 in. broad at the middle, proceeding from the apex of a slender sheathed pseudo-stem 6 in. long. *Flowering scape* 10 to 12 in. high, sheathed at intervals by membranous acute bracts each ·5 to 1 in. long; the *raceme* 2·5 to 3·5 in. long, rather dense. *Flowers* 1 in. across; *floral bract* membranous, linear, acuminate, longer than the slenderly-stalked ovary. *Sepals* wide-spreading, sub-equal, oblong-lanceolate, the dorsal erect; the lateral pair inserted on the column, recurved. *Petals* narrower than the sepals. *Lip* equal in length to the sepals and petals, elliptic or elliptic-obovate in general outline; the side lobes rounded, entire; the apical lobe separated by a small sinus from the lateral, transversely oblong, obscurely bifid, the margins irregularly dentate; the basal half of the disc with three sub-parallel

smooth sharp lamellæ ending in a densely setose patch on the mid-lobe; spur short, slender, straight, cylindric, only half as long as the column and lying parallel with it. *Column* dilated near the stigma and grooved in front, foot none. *Anther* conical, with a minute upturned lip in front. *Pollinia* broad, blunt, the caudicle stout, the gland elongate. Lindl. Gen. and Spec. Orch., 185; in Journ. Linn. Soc. III, 24 (*excl. syn. Wight*); Reichb. fil. in Walp. Ann. VI, 647; Hook. fil. Fl. Br. Ind. VI, 4. *E. ramentacea* and *E. rupestris*, Lindl. in Wall. Cat., 7367, 7368; Gen. and Spec. Orchid., 185; in Journ. Linn. Soc. III., 25. *E. hemileuca*, Lindl. in Journ. Linn. Soc. III, 25. *Limodorum ramentaceum*, Roxb. Hort. Beng. 63; Fl. Ind. III, 467. *Bletia dubia*, Don Prod. Fl. Nep., 30.

In the Terai and Duars at the base of the range, at elevations about 600 to 1,000 feet; Pantling, No. 431; in flower during March. Distributed on the plains of British India from the base of the Himalaya to the Deccan.

The flowers are pale pink with darker lines of the same colour.

PLATE 241.—*Eulophia campestris*, Wall. Plants, with flowering scape and with leaves; *of natural size*. Fig. 1 a flower, front view, 2 profile view of bract, stalked ovary, column and lip, 3 the lip, flattened out, 4 column, 6 the pollinia, from in front, 7 side view of one of the pollinia; *all enlarged*.

5. EULOPHIA SANGUINEA, Hook. fil. Fl. Br. Ind. V, 8.

Rhizome horizontal, fleshy, 1·5 to 2 in. thick. *Leaves* unknown. *Scape* 6 to 18 in. long, bearing several loose sheaths. *Raceme* 4 to 8 in. long and bearing six to twenty-five flowers 1·5 in. across; *floral bract* linear, nearly as long as the stalked ovary, deflexed. *Sepals* elliptic-oblong, sub-acute. *Petals* shorter than the sepals, obovate-oblong, the apex blunt, sub-apiculate, or sometimes notched. *Lip* about as long as the petals, oblong; the side lobes large, erect, truncate at the apex; the apical lobe ovate-triangular, obtuse, the edges undulate, the disc between the side lobes with two granular lamellæ; the base sub-calcarate and projecting. *Column* long, its foot broad, with dilated sides. *Anther* 2-lobed at the apex and with a small projection on the lip. *Pollinia* transversely ovate-orbicular, the caudicle rather thick, the gland broad and thin. *Cyrtopera sanguinea*, Lindl. in Journ. Linn. Soc. III, 32; Bot. Mag., t. 6161. *Eulophia macrorhizon*, Hook. fil. in Ann. Bot. Gard. Calcutta, V, 7.

Sikkim, at Mungpoo, elevation 2,000 feet; in flower during May and June, Hooker; Pantling, No. 186. Khasia Hills, elevation 5,000 feet; G. Mann, Rita.

The flowers are of an almost uniform dull brown, slightly streaked. Leaves of this have never been observed, and it is doubtful whether any are ever produced. None of the rhizomes collected and dried by Mr. Pantling showed any marks of having ever produced leaves; and on eight living plants under observation since May 1895 no leaves had appeared up to 1897, although the tubers were still alive. In the excellent figure of this plant in the Botanical Magazine (t. 6161) the lip is represented as white with pink markings and the calcarate base of the lip as green; and the apical lobe of the lip is described as 3-carinate at the base, the sepals and petals being represented as brownish rather than purple. The species is therefore apparently a variable one.

PLATE 242.—*Eulophia sanguinea*, Hook. fil. Rhizome and inflorescence; *of natural size*. Fig. 1 profile view of floral bract, stalked ovary, column and lip, 2 petals, 3 lip, 4 column with its foot, the anther *in situ*, and stigma, 5 anther, 6 pollinia before removal from the column, 7 the same some time after removal; *all enlarged*.

6. EULOPHIA NUDA, Lindl. in Wall. Cat., 7371; Gen. and Spec. Orch., 180.

Tuber spherical, smooth. *Leaves* from the side of the tuber, forming by their sheaths a short pseudo-stem, elliptic-lanceolate, acute, variable in breadth, 10 to 14 in. long, the sheath long and tubular. *Scape* from the base of the pseudo-stem, 2 to 3 feet long, with a few wide sheaths at the base and several scattered upwards. *Raceme* few- and laxly-flowered; *floral bract* lanceolate, half the length of the stalked ovary. *Sepals* oblong, acute, erecto-patent, the lateral pair falcate. *Petals* ovate-oblong, blunt, shorter than the sepals, the outer nerves branching. *Lip* as long as the sepals, deflexed from below the middle, oblong, the side lobes suppressed, the apical lobe oblong, much undulate, obtuse; the upper surface with many (usually about nine) vertical thickened lines disappearing about the middle. The base of the lip dilated, suddenly contracted to a short flattened spur the entrance to which is ribbed. *Column* short, with a long foot dilated at the margins. *Anther* small, its apex with two small conical knobs and a third depressed one in front. *Pollinia* 2, transversely oblong, attached by a very broad caudicle to a narrow gland. Hook. fil. Fl. Br. Ind. V, 6; in Ann. Bot. Gard., Calcutta, V, 32, tt. 47 to 50. *E. bicolor*, Dalz. in Hook. Kew Journ. Bot. III (1851), 343; Dalz. and Gibs. Bomb. Flora, 264; Walp. Ann. VI, 647. *Cyrtopera flava*, Wight Ic., t. 1690; Lindl. in Journ. Linn. Soc. III, 31; Thwaites' Enum., 429; Walp. Ann. l. c., 668; *Cyrtopera plicata*, Lindl. in Wall. Cat., 7362; Gen. and Spec. Orch., 190. *C. nuda*, Reichb. fil. in Flora, 1872, 274. *C. Gardneri*, Thwaites' Enum., 302. *C. mysorensis*, Lindl. in Journ. Linn. Soc. III, 32. *C. laxiflora*, Gard. MSS. ex Thw. Enum., 302. *Dipodium Roniata* and *D. plicatum*, Herb. Ham.

Sikkim, in tropical valleys, at elevations up to 1,500 feet; in flower from April to July; Pantling, No. 212.

This is a widely distributed and variable species. The Sikkim form has the sepals and petals pale green, the former with brown markings externally. The lip is of a very pale green at the base, becoming white at the middle and flushed with pink near the apex. The column is white and the anther is brownish. In the fifth volume of these Annals, Sir Joseph Hooker has given an account of four distinct forms of this species which are found in Burma, the first of the four being the one which seems to agree most closely with the plant from Nepal originally named *E. nuda* by Lindley. The varieties are all figured by Sir Joseph in the volume alluded to.

PLATE 243.—*Eulophia nuda*, Lindl. A plant; *of natural size*. Fig. 1 sepals and petals separated, 2 part of rachis, bract, ovary, column with anther *in situ* and lip, 3 column and its foot, the anther *in situ*, front view, 4, pollinia, *all enlarged*.

7. EULOPHIA BICARINATA, Hook. fil. Fl. Br. Ind. VI, 6.

Tuber oblong, irregularly lobed, compressed, about 2 in. long. *Leaves* absent at flowering time, linear, acuminate, much narrowed to the long petiole; length of blade 7 to 12 in., breadth about ·75 in.; *petiole* 6 to 8 in., sheathed at the base. *Scape* erect, 10 to 20 in. high, with two tubular closely fitting sheaths near the base and two shorter loose ones higher up. *Raceme* rather densely flowered, 3 to 5 in. long. *Flowers* 1 in. in diam.; *floral bract* membranous, lanceolate, shorter than the stalked ovary. *Sepals* oblong, acute, keeled, their edges reflexed, the lateral pair slightly wider than the dorsal and free from it at their bases. *Petals* narrowly elliptic, sub-acute, shorter but wider than the sepals. *Lip* adnate to the foot of the column, longer than the sepals,

slightly saccate at the base, 3-lobed; lateral lobes shallow, broad, with blunt apices; apical lobe transversely oblong, emarginate, the edges slightly crisped; the disc between the side lobes with two short smooth thickened lines half as long as the latter and ending in a free triangular tooth in front of which rise five carunculate unequal ridges which run on to the base of the apical lobe. *Column* erect, its edges lobed opposite the stigma, its foot half as long as itself and at right angles. *Anther* apiculate in front. *Pollinia* broadly triangular, divergent, attached by a broad caudicle to a thin angular gland. *Cyrtopera bicarinata*, Lindl. in Wall. Cat., 7363; Gen. and Spec. Orch., 189; in Journ. Linn. Soc. III, 31 (*excl. cit. Ic. Griff.*) *Cymbidium* sp., Griff. Notul. III, 343, No. 9.

Sikkim, at the foot of the range; in flower during March and April; Pantling, No 435.

There is a large form of this which, as it differs from the type-form in some other respects than size, we have made a variety.

Var. *major*; larger than the type, with larger tubers, stouter scapes, larger flowers (1·33 in. in expanse), in a less dense raceme; the lip with a dense cluster of callosities in front of the lamellæ.

Sikkim, at the foot of the range; in flower during March and April; Pantling, No. 436.

The sepals and petals are of a pale yellowish-green. The basal half of the lip is of the same colour, the apical lobe being of a very pale purple at the margins.

PLATE 244.—*Eulophia bicarinata*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, 3 lip, 4 column with its foot, and spur, 5 empty anther seen from below, 6 pollinia; *all enlarged*.

PLATE 244 *bis*.—*Eulophia bicarinata*, var. *major*, King and Pantling. A plant; *of natural size*. Fig. 1 a flower, 2 profile view of bract, stalked ovary, column and lip, 3 lip, flattened out, 4 column, 5 back view of anther, 6 back and front views of the pollinia; *all enlarged*.

35. Geodorum, Jackson.

Terrestrial, with underground sub-globose rhizomes. *Leaves* elliptic, plicate, their sheaths forming a pseudo-stem. *Scape* from the base of the pseudo-stem, stout, erect, sheathed, bearing a decurved corymbose raceme. *Flowers* rather crowded and narrow, about ·5 in. long. *Sepals* equal, oblong, sub-acute, erect. *Petals* as long as the sepals, but broader and blunt. *Lip* sessile on the base of the column, not narrowed at the callus-bearing base but broadly ventricose, without side lobes; the apical lobe broad, rounded, bifid or emarginate. *Column* less than half the length of the lip. *Anther* broad, two-celled. *Pollinia* 2, broadly and dimidiately ovoid, attached by a tapering slender caudicle to a small orbicular gland. Species about 10; Indian, Malayan and Australian.

A genus of terrestrial orchids closely allied to *Eulophia*, having a similar habit and lip. The genus is less closely allied to *Cremastra*, but has a very different lip. In the latter the lip has a long narrow body expanding at the apex into two acute lateral and one oblong terminal lobe, the latter having a large ligulate process near its base. In the present genus the lip is deeply ventricose at the base, there are no side lobes, and the terminal lobe at the apex of the sac is orbicular and without any ligule.

GEODORUM PURPUREUM, R. Brown in Ait. Hort. Kew, Ed. 2, V, 207.

Tuber globular, apiculate, 1·25 in. in diam. *Pseudo-stem* 3 to 6 in. long. *Leaves* elliptic, acute, tapering to the long sheath, 6 to 12 in. long and 3 to 4 in. broad.

Inflorescence shorter than the leaves, the raceme short, corymbose and drooping when in flower but lengthening and erect when in fruit; *floral bract* large, lanceolate, longer than the ovary. *Petals* with thickened midribs. *Lip* very ventricose at the base and much thickened; thickened also on the rounded minutely notched apical lobe, its disc much granulated. *Pollinia* 2, with elongate pits on their posterior surfaces. Lindl. Gen. and Spec. Orch., 175; Dalz. and Gibs. Bomb. Flora, 266; Hook. fil. Fl. Br. Ind. VI, 16. *G. dilatatum*, Wall. Cat. 7376. *Limodorum nutans*, Roxb. Corom. Plants I, t. 40; Fl. Ind. III, 470; *Malaxis nutans*, Willd. Sp. Pl. IV, 93.

Sikkim, at low elevations; in flower during April and May; Pantling, No. 279. Westward to Nepal and eastward to Bhutan; also in Assam, Bengal, Burma, the Andaman Islands, Ceylon and the Deccan; probably distributed in the Malayan countries.

The flowers are either pure white or pale purple with darker markings on the lip, the calli on the lip are yellow.

PLATE. 245.—*Geodorum purpureum*, R. Brown. A plant; *of natural size.* Fig. 1 floral bract, ovary and flower, 2 apex of column and lip, seen from the side, 3 section through the column and lip, 4 three-fourths view of column showing the large stigma and anther *in situ*, 5 anther with the valves turned outwards, 6 pollinia *in situ* on the column, front view, 7 back view of the pollinia showing the pits; *all enlarged.*

36. Cremastra, Lindl.

Terrestrial; *stem* bulbous at the base and proceeding from a large nodulated root-stock, tall, erect, stout, with several large loose sheathing bracts. *Leaves* radical, elliptic, plicate. *Flowers* long and narrow, in a conical crowded raceme, pendulous. *Sepals* and *petals* narrowly lanceolate, closely pressed together towards the base, spreading slightly towards the apex. *Lip* adnate to the base of the column, erect, linear, minutely sub-saccate at the base, slightly dilated and 3-lobed towards the apex; the lateral lobes narrowly oblong, divergent; the apical lobe exceeding the lateral, oblong, blunt, with a fleshy appendage near its base. *Column* long, slender, straight, dilated, and 3-lobed at the apex. *Anther* conical, 1-celled. *Pollinia* 4, cuneate-ovoid, compressed. *Stigma* very large. A single species; a native of India and Japan.

CREMASTRA WALLICHIANA, Lindl. in Wall. Cat., 7349; Gen. and Spec. Orch., 172.

Leaves usually two, on long petioles, sometimes spotted, plicate; length of blade 6 to 12 in., breadth 3 to 5 in., petiole 4 to 6 in. *Inflorescence* often twin, shorter than the fully developed leaves; the racemes conical, 4 to 6 in. long. *Flowers* narrow, imbricate, drooping, 1·2 to 1·4 in. long; *floral bract* lanceolate, much exceeding the short sessile ovary. Miq. Prol., 136; Franchet and Sabatier Enum. Pl. Jap. II, 24; Hook. fil. Fl. Br. Ind. VI, 16. *C. mitrata*, A. Gray, Bot. Jap. 411. *Hyacinthorchis variabilis*, Bl. Mus. Bot. Lugd. Bat. I, 48, t. 16; Walp. Ann. VI, 628.

Sikkim, at elevations of 6,000 to 8,000 feet; Hooker and others. Pantling, No. 142; in flower during April. Khasia Hills; Griffith (Kew Distrib.), No. 5204. Nepal; Wallich. Distrib., Japan.

The flowers of this are pink; the rachis of the raceme and its peduncle being green, speckled with brown. *Dactylostalix ringens*, Reichb. fil. Bot. Zeitung, 1878, p. 74, is probably this plant.

PLATE 246.—*Cremastra Wallichiana*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column with anther *in situ* and lip, 3 lip, 4 upper half of column with anther, *in situ*, 5 apex of the column showing the pollinia attached to their gland, 6 anther; *all enlarged*.

37. Oreorchis, Lindl.

Terrestrial; *pseudo-bulb* corm-like, broadly ovoid, 1- or 2-leaved. *Leaves* long, narrow. *Scape* tall, slender, produced from the side of the pseudo-bulb; *flowers* rather small, in racemes. *Sepals* ovate-lanceolate. *Petals* sub-similar and slightly spreading or sub-connivent. *Lip* more or less oblong, attached to the base of the column by a short narrow claw, gibbous at the base or not, the anterior part 3-lobed; the side lobes short, entire; the terminal lobe broad, more or less bifid. *Column* elongated, stout, more or less curved, the apex sub-truncate. *Anther* 1-celled. *Pollinia* 4, globose, united to a short common caudicle ending in a gland derived from the stigma. A genus of four species all inhabiting Northern Asia.

Lip with a short globose sac at the base; leaves oblong-lanceolate, solitary .	1.	*O. foliosa.*
Lip not saccate at the base; leaves linear, usually two	2.	*O. micrantha.*

1. OREORCHIS FOLIOSA, Lindl. in Journ. Linn. Soc. III, 27.

Pseudo-bulb about ·6 in. long, the base broad and bearing a few lax fibres. *Leaf* solitary, terminal, solitary, oblong-lanceolate, acuminate, narrowed at the base to a short petiole, plicate, with two or three very bold nerves and slender ones between; length 4 to 9 in., breadth ·5 to ·85 in., petiole ·75 to 2·25 in. *Scape* 12 to 18 in. long; the peduncle with two or three tubular closely fitting sheaths 1 to 2 in. long; *raceme* 3 to 8 in. long, laxly few-flowered; *floral bract* small, equalling in length the short pedicel of the ovary. *Flowers* ·5 in. long. *Sepals* ovate-lanceolate, sub-acute, the lateral pair produced at the base on to the sac of the lip. *Petals* broader than the sepals, but not quite so long, the apices of all more or less connivent. *Lip* longer than the sepals, deflexed from below the middle, clawed and shortly saccate at the base; side lobes broadly oblong, oblique, obtuse, 3-nerved, their edges entire; terminal lobe sub-reniform (when flattened out), shortly bifid, the margin thickened and erose; disc with five stout branching nerves but not lamellate. *Column* very slightly curved; the sides thickened, especially towards the base and passing into the short sac of the lip. Hook. fil. Fl. Br. Ind. V, 709. *Corallorhiza*, sp. Lindl. in Royle Ill. Him. Bot., 362.

Sikkim, Lachen Valley, elevat. 10,000 feet; Sir J. D. Hooker; Pantling, No. 399; in flower in July. North-west Himalaya; at Simla, Gamble, 7,800 ft. Gharwal; Royle. China; West Szechuen and Tibetan Frontier, Pratt, No. 19.

The flowers are reddish in colour.

PLATE 137.—*Oreorchis foliosa*, Lindl. A plant; *of natural size*. Fig. 1 flower, 2 bract, stalked ovary, column, lip (*anther and pollinia removed*), *seen from the side*, 3 lip flattened out, 4 column soon after fertilization; *all enlarged*.

2. OREORCHIS MICRANTHA, Lindl. in Journ. Linn. Soc. III, 27.

Pseudo-bulb about ·75 in. long, ovoid-conic, the base with a few fibres. *Leaves* usually two, with occasionally an abortive third, but often solitary, linear, passing at the

base into a sheath, boldly 1- or 2-nerved; length 6 to 12 in., breadth ·25 to ·4 in. (occasionally broader). *Scape* 12 to 18 in. long, rising from the side of the pseudo-bulb, the peduncle with two or three tubular sheaths; *raceme* 2 to 4 in. long, lax, few-flowered; *floral bract* minute, shorter than the pedicel of the ovary. *Flowers* ·4 in. long *Sepals* elliptic-lanceolate, sub-acute, slightly spreading. *Petals* narrower than the sepals, oblanceolate, sub-acute. *Lip* obovate-oblong; the base narrowed to a very short claw, not saccate; side lobes long, narrowly oblong, horizontal, entire, sub-acute; the terminal lobe deflexed from its base, broadly obovate, with a deep sinus in the middle and two broad lobules; the disc with a thick linear channelled fleshy callus. *Column* much curved, the base dilated and concave. *Pollinia* globular, united to a short thick caudicle. Hook. fil. Fl. Br. Ind. V, 709.

Sikkim, in the Lachen Valley, altitude 10,000 feet; Pantling, No. 400. Western Himalaya, altitude 8,000 to 10,000 feet; Strachey and Winterbotham, (Orchid No. 56).

The colour of the flowers is pale yellow, the lip being spotted with red.

PLATE 138.—*Oreorchis micrantha*, Lindl. A plant; *of natural size*. Fig. 1 flower, *front view*, 2 floral bract, pedicelled ovary, column (without anther) and lip, *side view*, 3 lip, 4 column, 5 pollinia; *all enlarged*.

38. Cymbidium, Swartz.

Epiphytal, with a short stout pseudo-stem; rarely terrestrial or with an elongated leaf-bearing stem. *Leaves* coriaceous, very long and narrow, rarely elliptic. *Inflorescence* from the side of the pseudo-stem; its peduncle usually with numerous sheaths; the *raceme* many- or few-flowered, erect or drooping; the *floral bract* various. *Flowers* usually large and handsome. *Sepals* and petals sub-equal, free-spreading or erect. *Lip* adnate to the base of the column and embracing it more or less by its convolute side lobes; the apical lobe decurved, often with undulate edges, the disc usually with two ridges or lamellæ. *Column* long, without a foot. *Anther* 1- or imperfectly 2-celled. *Pollinia* 2, ovoid, pyriform, cuneiform or globular, more or less partite, sessile, on a small or large often strap-shaped gland. Species about 60; tropical or sub-tropical, on mountains in Asia with a few from Africa and Australia.

I.—EUCYMBIDIUM. Sepals and petals spreading; pollinia transversely ovoid or pyriform, (sub-globular in No. 3), their points divergent; rostellum not beaked.

Terrestrial; inflorescense erect, capsules fusiform and also erect.

Leaves elliptic, borne on a stem . . . . . 1. *C. lancifolium.*

Leaves linear, their bases forming a short pseudo-stem, lamellæ flat.

Flowers green, the lip with purple markings; pollinia horizontal, ovoid or obovoid, with divergent points . 2. *C. cyperifolium.*

Flowers pale yellow marked with broken vertical purple lines; pollinia globular . . . . . 3. *C. Munronianum.*

Epiphytal; inflorescence decurved.

Flowers not more than 1·5 in. across (usually less) in any direction.

Inflorescence less than half the length of the leaves.

Sepals and petals purple, broadly edged with white; ridges of the lip two, glandular-pubescent . . 4. *C. Simonsianum.*

Sepals and petals dark purple edged with yellow, ridges of the lip two, smooth, parallel, continuous; leaves acute; entire at the apex . . . 5. *C. pendulum.*

Inflorescence nearly as long as the leaves.

Sepals and petals ochraceous, each with a central purple band; ridges of the lip two, smooth, not continuous (disjointed near the middle); leaves sessile, broadly linear-oblong (1 in. or more wide), blunt and notched at the apex . . 6. *C. aloifolium.*

Sepals and petals purplish-brown with green stripes, ridges of the lip short, broad, smooth, continuous; leaves oblong-oblanceolate, petiolate . 7. *C. Devonianum.*

Flowers 2·5 to 4 in. in diam.

Sepals and petals pale green with numerous close purplish-brown stripes; lip white, striped and spotted with purple . . . . . 8. *C. longifolium.*

Flowers yellow with numerous brown stripes, the apical lobe of the lip with transverse blotches . . . . . 9. *C. giganteum.*

Sepals and petals pale green, not striped or spotted; lip yellow, spotted with brown . . . . . 10. *C. grandiflorum.*

II.—Cyperorchis. Sepals and petals sub-equal, erect and connivent (spreading in Nos. 11, 15 and 16), long and narrow; lip narrow with the apical lobe small and sub-orbicular, pollinia cuneate or obovoid, rostellum beaked.

Pollinia cuneate, compressed.

Flowers ochraceous, striped and flushed with brown, the tips of the side lobes of the lip speckled with pink and the apical lobe yellow with purple spots; sepals and petals slightly spreading . . . . . 11. *C. Gammieanum.*

Sepals and petals pale yellowish-green spotted with dull red; lip pink spotted . . . . . 12. *C. Whiteæ.*

Pollinia obovoid or pyriform, not compressed.

Flowers numerous, imbricate, pale yellow; lamellæ of lip long and narrow . . . . . 13. *C. elegans.*

Flowers numerous, greenish-brown, the lip yellow speckled with red, with smooth lamellæ . . . . . 14. *C. cochleare.*

Flowers few, white tipped with pink; the lip flushed with yellow, its two lamellæ orange-coloured . . . . . 15. *C. Mastersii.*

Flowers 1 or 2, pure white; the lip with three ridges of a brilliant yellow colour . . . . . 16. *C. eburneum.*

1. Cymbidium lancifolium, Hook. Exot. Flora, t. 51.

Terrestrial; *stems* narrowly fusiform, 2 to 6 in. long, clothed with many large scarious sheaths and fibres, the roots long, thick and spongy. *Leaves* 3 or 4, oblong-oblanceolate, acute, narrowed into a very long petiole sheathing at its base; length of blade 6 to 8 in., breadth 1 to 1·25 in., petiole 4 to 8 in. *Raceme* shorter than the leaves; its peduncle 2 or 3 in. long, with several short lax sheaths. *Flowers* 3 or 4, distant, 1·5 in.

rarely 2 in. across, *floral bract* much shorter than the pedicelled ovary. *Sepals* sub-equal, oblanceolate, acute. *Petals* shorter than the sepals, but of similar shape. *Lip* as long as the petals, 3-lobed; the lateral lobes broad, rounded, entire; the apical lobe narrow, sub-acute, much recurved; the disc between the lobes with two horizontal thickened lamellæ and broader at the apex than at the base. *Column* long, erect, curved. *Anther* quadrate, granular externally, 2-celled. *Pollinia* obliquely ovoid, pointed, diverging, sessile on a broad gland. *Capsule* fusiform, beaked, sharply 3-angled, 3 in. long. Lindl. Gen. and Spec. Orch., 164; in Journ. Linn. Soc. III, 30; Wall. Cat., No. 7351; Lodd. Bot. Cab., t. 927; Hook. fil. Fl. Br. Ind. VI, 9. *C. Gibsoni*, Paxt. Fl. Gard. III, 618, t. 301; Walp. Ann. VI, 623. *C. Javanicum*, Blume Bijdr. 380; Lindl. Gen. and Spec. Orch., 170; Griff. Ic. Plant. Asiat., t. 300, fig. 1.

Sikkim, near Sureil, elevation 6,000 feet; in flower during June; Pantling, No. 75. Westward along the range to Nepal and eastward to Mishmi. Khasia Hills, altitude 4,000 to 6,000 feet; Griffith, Simons. Naga Hills; Prain. Perak; Kunstler, Scortechini. Distrib. Java.

The sepals and petals of this are green, the latter having a red median stripe; the lip is white with red transverse bars.

PLATE 247.—*Cymbidium lancifolium*, Hook. A plant; *of natural size*. Fig. 1 column with anther *in situ* and lip, side view, 2 lip, flattened out, 3 cross section of the lip where its lamellæ meet, 4 column with anther *in situ*, 5 profile view of the upper part of the column, the anther-cap having been removed, 6 upper surface of anther, 7 lower surface of the same, 8 pollinia; *all enlarged*, 9 capsule, 10 transverse section of the same; *of natural size*.

2. CYMBIDIUM CYPERIFOLIUM, Wall., Cat. 7353 (*in part*).

Terrestrial; *pseudo-stem* thin, short. *Leaves* linear, finely acuminate, slightly expanded towards the sheathing base; length 9 to 30 in., breadth ·25 to ·4 in., the lower two or three short and sheath-like. *Inflorescence* from the base of the pseudo-stem, erect, about a foot long; the peduncle clothed to the base of the raceme with long acuminate sheaths. *Raceme* 3- to 7-flowered. *Flowers* about 1 in. long and about 1·5 in. across; *floral bract* lanceolate, acuminate, longer than the stalked ovary. *Sepals* sub-equal, narrowly oblong, acute, spreading. *Petals* slightly shorter than the sepals and somewhat broader. *Lip* glabrous, as long as the petals, oblong (when spread out), 3-lobed; the lateral lobes long, narrow, erect; apical lobe abruptly deflexed, ovate or oblong-ovate, sub-acute or blunt, entire, the disc between the side lobes with two smooth lamellæ. *Column* rather stout. *Anther* broad. *Pollinia* obliquely ovoid, divergent, cleft to nearly the base, sessile on a very narrow elongate gland. *Capsule* ellipsoid-clavate, 2·5 in. long. Lindl. Gen. and Spec. Orch., 163; in Journ. Linn. Soc. III, 28; Hook. fil. Fl. Br. Ind. VI, 13 (*excl. syn. Limodorum longifolium*, Roxb.) *C. viridiflorum*, Griff. Itin. Notes, 126, No. 454.

Sikkim, at Choong thang, elevation 5,000 feet; in flower during November; Pantling, No. 306. Westward to Gharwal, at elevations of about 5,000 feet, and eastwards to Bhutan. Khasia and Naga Hills, at elevations of 3,500 to 6,500 feet. Shan Hills, in Burma. Perak; Java.

The flowers of this are green, becoming yellowish with age; the ovary and its stalk are dull purple, and the lip has streaks and blotches of the same colour. They are

fragrant. The rachis of the raceme is also purplish. The Ceylon plant named *C. hæmatodes* by Lindley is considered by Sir Joseph Hooker to be only a form of this. It has (according to Lindley) white sepals and petals with rose-coloured veins, a white lip with red spots and a yellow column. We have tentatively excluded from the synonymy of this *Limodorum longifolium*, Roxb. (Fl. Ind. III, 468), because the author's own drawing of that plant in the Calcutta Herbarium represents the colour of the flowers as of a deep rose colour, and the lip as deflexed and flattened. It is just possible, however, that Roxburgh's figure may have been coloured reddish instead of yellowish, by some blunder of the draftsman, and that the lip also may have been wrongly represented. In all other respects (including the terrestrial habit) Roxburgh's drawing of *Limodorum longifolium* would pass for one of *Cymbidium cyperifolium*. And we know of no other orchid to which this plant of Roxburgh's can be referred without even greater difficulty. Part of Wallich's No. 7353, although named *C. cyperifolium* by himself, is really *C. longifolium*, Don.

PLATE 248.—*Cymbidium cyperifolium*, Wall. An entire plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther and lip, in profile, 3 lip, 4 column and anther, 5 anther, 6 pollinia, 7 a capsule; *all enlarged*.

3. CYMBIDIUM MUNRONIANUM, King and Pantling in Journ. As. Soc. Beng. LXIV, Pt. 2, p. 338.

Terrestrial; *leaves* stiff, erect, linear, acuminate, 16 to 20 in. long and ·75 in. broad, tapered into a petiole or not. *Racemes* stout, erect, about 1 foot long, (about half being stalk), with two or three distant closely embracing sheaths 1 in. long. *Flowers* about 7 or 8, distant, 1 in. in diam.; *floral bract* shorter than the stalked ovary, lanceolate. *Sepals* and *petals* sub-equal, oblong-lanceolate, acute. *Lip* lanceolate (when flattened out), everywhere concave on the upper surface; the lateral lobes elongate and shallow, the disc with two parallel smooth lamellæ in its centre ending with the side lobes, the apical lobe narrow and reflexed. *Pollinia* plano-convex, bifid, sessile on the narrow gland.

Sikkim, in the Teesta Valley, on dry knolls at an elevation of 1,500 feet. Bhutan Duar; flowering in May; Pantling, No. 256.

The flowers of this species are sweetly-scented, the sepals and petals are straw-coloured and each has five dotted or streaked lines, the lip being pink except its apical lobe which is pale yellow transversely blotched with red. Its nearest ally is *C. ensifolium*, Swartz, under which it appears to be included by Lindley and other authorities. But this Sikkim plant appears to us to differ very materially from the true Chinese *C. ensifolium*. The species is dedicated to the late Mr. James Munro, for many years resident in Sikkim and well known, not only as a lover of plants, but as a man of great sincerity, and of unlimited kindness and hospitality. This is the Sikkim plant referred to in a note under the description of *C. ensifolium* in the Flora of Br. Ind. VI, 14.

PLATE 249.—*Cymbidium Munronianum*, King and Pantling. A plant; *of natural size*. Fig. 1 lip, 2 floral bract, stalked ovary, column with anther and lip, side view, 3 part of ovary, column and anther, 4 empty anther from behind, 5 pollinia, front and back view; *all enlarged*, 6 capsules; *of natural size*.

4. Cymbidium Simonsianum, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, p. 338.

Leaves linear, sessile, not dilated at the base, the apex acute and sub-oblique, length 3 feet or more, breadth ·4 or ·5 in. *Raceme* 8 in. long, pendulous, shortly stalked, sheathed at the base by large imbricate bracts 1 to 2·5 in. long. *Flowers* about 10 to 12, sparse; their bracts triangular, very short. *Sepals* sub-equal, linear-oblong, slightly wider near the apex, about 1 in. long. *Petals* rather shorter than the sepals, connivent round the column. *Lip* with long shallow erect blunt entire side lobes parallel with, and as long as, the column; the *apical lobe* ovate, apiculate, deflexed; lamellæ of the lip stout, parallel, clothed with glandular hairs, ending abruptly with the side lobes, but continued partly into the apical lobe as thickened lines. *Pollinia* falcately ovoid, compressed, divergent, the gland narrow.

Sikkim, in the valley of the Teesta, elevation about 1,000 feet; Pantling, No. 51. Flowers in August. Assam; locality unknown.

The flowers of this species are sweet-scented; the sepals and petals are white with a crimson central line; the lip is purple, but has oblique white and yellow lines on the lateral lobes, with a large blotch of yellow on the apical lobe; the column is of a very dark crimson, and the anther of a pale yellow colour. Specimens of this plant were sent many years ago from Assam by the late Dr. J. C. Simons, to whom the Calcutta Herbarium is indebted for numerous contributions of plants, and for a large number of drawings of orchids. The species has been dedicated to his memory.

Plate 250.—*Cymbidium Simonsianum*, King and Pantling. A plant; *of natural size*. Fig. 1 column with anther *in situ* and lip, side view, 2 lip, 3 column with anther, 4 section through the lip to show the lamellæ with their glandular hairs, 5 empty anther from behind, 6 pollinia, front view, 7 the same, back view; *all enlarged*.

5. Cymbidium pendulum, Swartz in Nov. Act. Upsal. VI, 73.

Pseudo-stem stout, 3 in. long. *Leaves* linear-oblong, acute, not notched, 24 to 30 in. long and ·75 to 1 in. broad, sheathing and expanded at the base. *Inflorescence* 10 or 12 in. long, decurved from the base; the peduncle about 3 in., clothed with imbricate withered sheaths each ·5 to 2 in. long. *Flowers* numerous but not crowded, 1·25 in. across; *floral bract* small, triangular, stalked ovary ·5 in. long. *Sepals* equal, oblong, slightly dilated near their blunt apices. *Petals* nearly as long as the sepals and a little wider. *Lip* adnate to the short foot of the column, oblong, dilated and sub-saccate at the base; side lobes narrow, their apices blunt and pointed forwards; apical lobe oblong, blunt, emarginate, much decurved; disc between the side lobes with two parallel continuous lamellæ divergent at the base, meeting in the middle, and slightly separating at their clavate apices. *Column* erect, slightly narrower at the apex than at the base, with a very short foot. *Anther* broad, depressed, minutely papillose. *Pollinia* ovoid, acute, diverging, sessile on a broad thin narrow gland. Roxb. Fl. Ind. III, 458; Lindl. Gen. and Spec. Orch., 165; Walp. Ann. VI, 624 (*excl. cit. Bot. Reg.*) *C. aloifolium*, Hook. fil. Fl. Br. Ind. VI, 10 (*in part*). *C. crassifolium*, Wall. Cat., 7357. *C. Mannii*, Reichb. fil. in Flora, 1872, 274. *Epidendrum pendulum*, Roxb. Corom. Plants, I, 35, t. 44.

Sikkim, at the bottoms of tropical valleys and along the base of the range, common; in flower during May; Pantling, No. 441. In Bengal, Assam, Sylhet, Burma, Andaman Islands, S. India. Perak; Wray, No. 3738.

The flowers of this are of a dark purple brown throughout, the sepals and petals having yellow margins. This resembles *C. aloifolium*, Swartz, but has narrower leaves, acute, not emarginate at the apex, and a shorter raceme which is pendulous from its origin. The flowers also are smaller, and the ovary is only half as long as in that species. The lip also differs, being continuously bilamellate in this, and the apical lobe being emarginate at the apex. The flowers of this are much darker in colour than those of *C. aloifolium*, Swartz, as the latter occurs in Sikkim. The two plants are apparently distinct, and no intermediate forms are found. They are readily recognised in the living state while in flower; but, in the Herbarium, it is not easy to distinguish them.

PLATE 251.—*Cymbidium pendulum*, Swartz. A plant; *of natural size*. Fig. 1 floral bract, stalked ovary, column, anther *in situ* and lip, in profile, 2 lip, 3 column with anther, 4 empty anther from behind, 5 pollinia; *all enlarged*.

6. CYMBIDIUM ALOIFOLIUM, Swartz in Nov. Act. Upsal. VI, 73.

Pseudo-stem short. *Leaves* linear-oblong, curved, obtuse, fleshy, slightly and obliquely notched at the apex, somewhat sheathing and slightly expanded at the base; length 12 to 22 in., breadth 1 to 1·15 in. *Inflorescence* from the base of the small pseudo-stem, somewhat shorter than the leaves; the peduncle 3 or 4 in. long, bearing several tubular acute scarious sheaths near the base; *raceme* many-flowered, decurved, 9 to 18 in. long. *Flowers* 1·5 in. across; the *floral bract* ovate, minute, the stalked ovary nearly 1 in. long. *Sepals* sub-equal, oblong, slightly oblanceolate, blunt, the lateral pair somewhat falcate. *Petals* as long as the sepals, ovate-oblanceolate, blunt. *Lip* as long as the sepals, oblong, 3-lobed, its upper surface with two lamellæ broken and disconnected in the middle; the lateral lobes long, narrow, their apices blunt, entire, pointing forwards; the apical lobe ovate-oblong, much decurved. *Column* slightly thickened at the apex. *Anther* papillose, sub-quadrate, the gland of the *pollinia* small. *Capsule* elliptic, pointed at each end, 3-grooved. Swartz in Schrad. Journ. Bot. 1779, II, 218; Roxb. Fl. Ind. III, 458; Lindl. Gen. and Spec. Orch., 165; Lodd. Bot. Cab., t. 967; Walp. Ann. VI, 624 (*excl. ic. Wight*); Hook. fil. Fl. Br. Ind. VI, 10 (*in part*). *Epidendrum aloifolium*, Linn. Sp. Pl. 953. ?*Aerides Borassi*, Smith in Rees' Cyclop. Suppl. (*in part*). *Epidendrum aloides*, Bot. Mag., t. 387.

Sikkim, at low elevations; in flower during April and May; Anderson; Pantling, No. 268. In Bengal, Assam, Andaman Islands, Perak. South of India; Wight, No. 2989. Ceylon; Thwaites, C. P., 3379 (named *C. bicolor*). ? China.

There has been some confusion between Swartz's two species *C. aloifolium* and *C. pendulum*. This confusion is partly dissipated if Swartz's original descriptions be consulted. From these it will be seen that both species were founded on figures, not on plants. *C. aloifolium* was founded on Rheede's figure of Kansjiram-Maravara in Vol. XII, t. 8 of his *Hortus Malabaricus* (which Linnæus named *Epidendrum aloifolium* Sp. Pl. 1350). And *C. pendulum* was founded on Roxburgh's figure of *Epidendrum pendulum* in his Coromandel Plants, I, t. 44. The next author who dealt with the two

was Lindley who, in his Genera and Species of Orchids, kept them both up, distinguishing them thus:

	C. aloifolium.	*C. pendulum.*
Sepals and petals ...	lanceolate, rather obtuse.	linear-oblong, obtuse.
Lateral lobes of lip ...	oblong, obtuse.	ovate, acute.
Lamellæ of lip ...	interrupted, clavate, curved in the lower half.	continuous, approximated at the apex.

Sir Joseph Hooker in his Flora of British India united the two under the name *C. aloifolium;* and, if Herbarium material only be examined, there is much to be said for this treatment. The plants as they grow, which they do side by side in Sikkim, appear however so different that we have kept up both as a species. The sepals and petals of *C. aloifolium*, as we have figured it, are yellowish, each having a broad mesial purple stripe. The upper surface of the lip is purple, with darker lines of the same colour and a patch of whitish at the base of the apical lobe. The outer surface is yellowish and striped only on the apical lobe. It has broader, blunter, and more coriaceous leaves than *C. pendulum*, and their apices are notched; the peduncle of the raceme being erect, while the raceme itself is decurved; whereas in *C. pendulum* the peduncle is decurved from its origin from the stem.

PLATE 252.—*Cymbidium aloifolium*, Swartz. A plant; *of natural size.* Fig. 1 apex of ovary, column and lip, *side view*, 2 lip, front view, 3 front view of column with anther, 4 empty anther, 5 pollinia *in situ* after removal of anther-cap, front view, 6 pollinia and gland after removal, back view; *all enlarged.*

7. CYMBIDIUM DEVONIANUM, Paxt. Mag. Bot. X, 97, *cum ic.*

Pseudo-stem short, clothed with large scarious imbricate acute sheaths. *Leaves* two or three, coriaceous, narrowly oblong-oblanceolate, sub-acute, attenuated into a long-channelled petiole; length of blade 9 to 12 in., breadth 1·5 to 2 in., petiole 5 to 8 in. long. *Inflorescence* about as long as the leaves, pendulous, the peduncle shorter than the raceme, bearing four to six loose lanceolate acuminate sheaths. *Raceme* many-flowered. *Flowers* about 1·25 in. across vertically, and about ·85 in. horizontally; *floral bract* small, oblong, acute, much shorter than the stalked ovary. *Sepals* sub-equal, oblong-lanceolate, acute, spreading, curved. *Petals* as long as the sepals, ovate-lanceolate, spreading. *Lip* as long as the petals, oblong, concave, decurved from the base; the side lobes obscure, gradually passing into the triangular-ovate mid-lobe; the lamellæ short, broad, smooth. *Column* winged towards the apex, the base narrowed and with two small glands. *Anther* dome-shaped. *Pollinia* ovoid, pointed, diverging, sessile on a broad gland. *Capsule* ovoid, pointed at each end, nearly 1·5 in. long. Warner Orch. Alb., t. 170; Reichb. fil. in Gard. Chron., 1881, I, 395; Hook. fil. Fl. Br. Ind. VI, 10.

Sikkim, at elevations of from 5,000 to 7,000 feet; in flower during May and June; Pantling, No. 265.

The flowers vary in colour from brownish to purple. The common coloration in Sikkim is that shown here, viz., sepals and petals purplish-brown with green lines; lip of a darker hue, with a white patch mottled with purple near the base; column greenish with purple blotches at apex and base.

PLATE 253.—*Cymbidium Devonianum*, Paxt. A plant; *of natural size*. Fig. 1 bract, stalked ovary, column with anther *in situ* and lip, 2 lip, 3 column and anther, 4 anther from behind, 5 pollinia, resting on the column; pollinia from behind; *all enlarged*.

8. CYMBIDIUM LONGIFOLIUM, Don Prodr., 36.

Pseudo-stem short. *Leaves* linear, acuminate, channelled below, dilated and equitant at the very base, 24 to 36 in. long and only ·5 to ·65 in. broad. *Inflorescence* very stout, sub-erect in the lower but decurved in the upper half, shorter than the leaves; the peduncle sheathed nearly to the apex; the sheaths larger upwards, all loose and acute. *Raceme* 10- to 15-flowered. *Flowers* 2·5 to 3 in. across; *floral bract* minute, triangular, the stalked ovary about 1 in. long. *Sepals* sub-equal, oblong, sub-acute, the dorsal broader and incurved, the lateral pair spreading. *Petals* as long as the sepals but narrower, spreading. *Lip* oblong, contracted near the base into a short claw; side lobes long, narrow, their acute pointed apices directed forwards; apical lobe thinly pubescent on its upper surface, decurved, orbicular, acute, the edges slightly undulate. *Column* erect, slightly saccate at the base. *Anther* broad, dome-like. *Pollinia* ovate, diverging, sessile on a quadrate gland of which the lower corners are elongated into narrow points. Wall. Cat. 1356; Lindl. Gen. and Spec. Orch., 163; in Journ. Linn. Soc. III, 29; Reichb. fil. in Gard. Chron, 1874, 1, 14; Hook. fil. Fl. Br. Ind. VI, 13. *C. erythræum*, Lindl. in Journ. Linn. Soc. III, 30. *Limodorum angustifolium*, Herb. Ham.

Sikkim, at elevations of 5,000 to 7,000 feet; in flower during September and October; Pantling, No. 8. Westward to Gharwal and eastward to Bhutan. Khasia and Naga Hills; at elevations of from 3,500 to 6,000 feet.

This bears a strong general resemblance to *C. giganteum*, Wall., but its leaves are somewhat narrower. The greatest differences, however, lie in the flowers which have narrower and differently coloured sepals, and in the lip which in the two is dissimilar both in colour and in shape. In this the ground colour of the sepals and petals is pale green, copiously striped with brownish-purple, the dorsal sepal externally being of a dark green indistinctly striped. The disc and apical lobe of the lip are pure white, spotted with purple, the side lobes being ochraceous with numerous close purple lines.

PLATE 254.—*Cymbidium longifolium*, Don. Parts of a plant; of *natural size*. Fig. 1 lip, 2 column with anther *in situ*, 3 empty anther, 4 pollinia, front view, 5 the same, back view; *all enlarged*.

9. CYMBIDIUM GIGANTEUM, Wall. Cat. 7355.

Pseudo-stem and inflorescence as in *C. grandiflorum*. *Leaves* also similar, but broader and not quite so long. *Flowers* smaller, only 2·5 to 3 in. across; *floral bract* minute, broad. *Sepals* sub-equal, elliptic-oblong, sub-acute, the dorsal incurved, the lateral pair spreading. *Petals* as long as the sepals but narrower, oblong, sub-acute. *Lip* shorter than the sepals, 3-lobed, more or less puberulous; the lateral lobes large, their apices elliptic and directed forward; apical lobe ovate-oblong, sub-acute, deflexed, its edges undulate-crenate; upper surface with two parallel ridges running from the base nearly to the apex, hairy and separated by a smooth groove. *Column* somewhat curved, its base below the insertion of the lip with a small nectar-bearing sac. *Anther* slightly scabrid. *Pollinia* ovoid, acute, diverging, sessile on a quadrate gland. *Capsule* elliptic, pointed at each end, boldly ridged, 3 in. long. Lindl. Gen. and Spec. Orch., 163;

Sert. Orchid, t. 4; Bot. Mag., t. 4844; Paxt. Mag. Bot., 241, and Fl. Gard. II, 14, fig. 143; Griff. Notul. III, 341; Walp. Ann. VI, 626; Warner Orch. Alb. VI, t. 284; Hook. fil. Fl. Br. Ind. VI, 12. *Iridorchis gigantea*, Blume Orch. Archip. Ind., 76, t. 26. *Limodorum longifolium*, Ic. Ham.

Sikkim, at elevations between 4,000 and 6,000 feet; in flower during October and November, common; Pantling, No. 12. Westward to Kumaon and eastward to Bhutan. Khasia Hills; elevation 4,000 to 5,000 feet.

The flowers of this have a ground colour of ochraceous yellow with numerous vertical lines of warm brown, the lip having broad transverse blotches of the same tint, externally the sepals are flushed with green. In habit and leaves the species much resembles *C. grandiflorum;* but the flowers are smaller, differently coloured and appear much later in the year. In the figure of this in Bot. Mag., No. 4844, the flowers are coloured by far too green.

PLATE 255.—*Cymbidium giganteum*, Wall. Parts of a plant; *of natural size*. Fig. 1 side view of column and lip, 2 column and anther *in situ*, 3 lip, 4 apex of column showing the pollinia after the removal of the cap of the anther, 5 pollinia, 6 empty anther, from behind; *all enlarged*; 7 capsule; *of natural size*.

10. CYMBIDIUM GRANDIFLORUM, Griff. Notul. III, 342.

Pseudo-stem very short. *Leaves* linear-oblong, acute, entire, narrowed towards the base and then expanded and equitant; length 16 to 24 in., breadth ·75 to 1 in. *Inflorescence* from the base of the pseudo-stem, about as long as or longer than the leaves (2 to 4 feet long), decurved; the peduncle stout, enveloped in numerous imbricate acute sheaths increasing in length upwards. *Raceme* laxly 10- to 20-flowered. *Flowers* 3 to 4 in. in diam.; *floral bract* minute. Dorsal *sepal* oblong, acute, incurved; the lateral pair slightly narrower and more acute, sub-falcate, spreading. *Petals* smaller than the sepals, oblong, somewhat falcate, spreading. *Lip* as long as the sepals, 3-lobed, pubescent and with ciliate edges, not saccate at the base; side lobes narrow, erect, their apices oblique, acute; apical lobe large, broadly oblong, deflexed, its apex deeply emarginate and its margins undulate, disc between the side lobes with two parallel bold hairy ridges. *Column* slightly winged from base to apex, straight; the *anther* sub-quadrate. *Pollinia* ovoid, acute, divergent, sessile on a quadrate gland. *Capsule* elliptic, boldly ridged, 2·75 in. long. Griff. Ic. Plant. Asiat., t. 321; Hook. fil. Fl. Br. Ind. VI, 12. *C. Hookerianum*, Reichb. fil. in Gard. Chron., 1866, 7; Batem. in Bot. Mag., t. 5574. *C. giganteum*, (*in part*), Lindl., Journ. Linn. Soc. III, 29. *Cymbidium* sp. Griff. Itin. Notes, 145, No. 698.

Sikkim, at elevations of 5,000 to 7,000 feet; in flower during February; Pantling, No. 63. Westward to East Nepal and eastward to Bhutan; Griffith and others.

The sepals and petals are apple green, the margins being of a paler tint; the lip and column are ochraceous yellow speckled with purple. This species often attains a greater size than is given in the preceding description, the scape and raceme together sometimes measuring 3 to 5 feet in length; and the latter having as many as eighteen flowers. After fertilization of a flower has been effected the column and lip become red in colour. The flowers are fragrant.

PLATE 256.—*Cymbidium grandiflorum*, Griff. Part of a plant; *of natural size*. Fig. 1 column, 2 section of lip between the side lobes showing the two hairy ridges, 3 empty anther, from behind, 4 apex of the column showing the pollinia after removal of the cap of the anther, 5 pollinia; *all enlarged*.

11. Cymbidium Gammieanum, King and Pantling in Journ. As. Soc. Beng. Vol. LXIV, Pt. 2, p. 339.

Pseudo-stem short. *Leaves* narrowly linear, acuminate, slightly narrowed below, but somewhat dilated at the equitant base, 24 to 36 in. long, and about ·75 in. broad. *Inflorescence* from the base of the pseudo-stem, decurved, shorter than the leaves; the peduncle sub-erect, about 15 or 18 in. long, enveloped to the apex in loose lanceolate sheaths, acuminate, 3 to 6 in. long. *Raceme* lax or dense, rather shorter than the peduncle, bearing 15 to 20 flowers; *floral bract* minute. *Flowers* 1·75 in. long, and 2·5 to 3 in. across. *Sepals* linear-lanceolate or linear-oblanceolate, 7-nerved. *Petals* linear-oblong, sub-falcate, slightly shorter than the sepals, 7-nerved. *Lip* about as long as the sepals, oblong; the side lobes shallow, elongate, acute at the apex; the apical lobe sub-orbicular, undulate, puberulous, separated from the lateral lobes by a sinus; lamellæ of the lip 2, pubescent, meeting and ending abruptly with the side lobes opposite the ciliolate sinus, otherwise parallel. *Column* slender, slightly winged. *Pollinia* erect, cuneate, sessile on a quadrate gland. *Capsule* 2 in. long.

Sikkim, at elevations of from 5,000 to 7,000 feet; flowering in September and October; Pantling, No. 299.

The colour of the flowers in this species is a dirty yellow flushed with brown and with brown lines; the lip, however, is of a brighter yellow and has brown lines on its side lobes. Individuals with flowers of a paler yellow are, however, very common, and these have usually densely-flowered racemes like *C. elegans*, Blume; while the plants with dirty yellow flowers have lax racemes suggestive of those of *C. longifolium*, Don. This species, although common in Sikkim, has hitherto remained unnamed. It has been suggested that it may possibly be a natural hybrid between *C. giganteum* and *C. elegans*, as its flowers combine the characters of these species. It is dedicated to Mr. J. A. Gammie, Deputy Superintendent of the Government Cinchona Plantation in Sikkim, whose work in the cultivation of the medicinal species of *Cinchona* and in the local manufacture of Quinine is so well known and so highly appreciated. The species is allied to *C. Mastersii*, Benth. and to *C. affine*, Warn.

Plate 257.—*Cymbidium Gammieanum*, King and Pantling. Part of a plant. Fig. 1 column with anther *in situ*, 2 lip, 3 side view of the same; *all of natural size*, 4 pollinia *in situ* on the apex of the column, the cap of the anther having been removed, 5 pollinia removed from the column and seen from behind, 6 empty anther, lower surface; *all enlarged.*

12. Cymbidium Whiteæ, *new species.*

Pseudo-stem 2 to 6 in. long. *Leaves* linear, acuminate, narrow in the lower two-thirds, but dilated at the equitant base, 24 to 36 in. long and about ·65 in. wide at the widest point. *Inflorescence* from the base of the pseudo-bulb, 15 to 18 in. long, strongly decurved from the base; the peduncle as long as the raceme, clothed throughout with scarious oblong-lanceolate acuminate bracts 1 to 5 in. long. *Raceme* 6 to 8 in. long, 10- to 12-flowered. *Flowers* 1·75 in. long; *floral bract* ·25 to ·35 in. long, lanceolate, acuminate, shorter than the stalked ovary. *Sepals* lanceolate, acute, connivent. *Petals* linear-oblong, sub-falcate, as long as the sepals. *Lip* as long as the lateral sepals, sparsely pubescent on the upper surface; side lobes shallow, elongate, their apices oblique, sub-acute, directed forwards; apical lobe orbicular, crenate-undulate, slightly deflexed, disc with two

pubescent lamellæ near the apices of the side lobes becoming faint towards the base. *Column* straight except at the summit. *Anther* oblique with a blunt apex and beaked lip. *Pollinia* cuneate, sessile on a quadrate gland. *Capsule* ellipsoid, 1·75 in. long.

Sikkim, at Gantok, elevation 5,000 feet; discovered by Mrs. Claude White, after whom it is named; in flower during November; Pantling, No. 425.

The sepals and petals are pale yellowish-green spotted with dull red. The lip is white or pale pink spotted profusely on the side- and end-lobes with pale red.

PLATE 258.—*Cymbidium Whiteæ*, King and Pantling. Part of a plant; *of natural size.* Fig. 1 bract, stalked ovary, column and lip, seen from the side, 2 lip, 3 column with anther *in situ*, 4 front and back views of the pollinia, 5 pollinia and gland, 6 empty anther; *all enlarged.*

13. CYMBIDIUM ELEGANS, Lindl. in Wall. Cat., 7354; Gen. and Spec. Orch., 163.

Pseudo-stem short. *Leaves* narrowly linear, acuminate, slightly expanded and equitant at the base; length 18 to 24 in., breadth ·65 to ·75 in. *Inflorescence* axillary, decurved, about as long as the leaves; the peduncle longer than the raceme, clothed to the apex by a few lanceolate acuminate convolute sheaths 4 to 6 in. long; *raceme* imbricately and densely flowered; *floral bract* membranous, minute. *Flowers* 1·5 to 1·75 in. long and only about ·6 in. across. *Sepals* and *petals* sub-equal, erect, oblanceolate-oblong, acute or sub-acute and slightly concave at the tips. *Lip* as long as the petals, narrowly oblong; the side lobes near the apex, incurved, rounded; the disc between them with two narrow parallel ridges united at the apex and with a large pubescent callus at the base; the apical lobe small, sub-orbicular or obcordate, undulate, incurved. *Column* long, slender, slightly pubescent at the base in front, the apex slightly curved forwards. *Anther* terminal, ovoid, beaked in front. *Pollinia* obovoid, erect, sessile on a quadrate gland. *Capsule* elliptic, 1·25 in. long and ·75 in. in diam. Lindl. Sert. Orch., t. 14; in Journ. Linn. Soc. III, 28; Reichb. fil. in Gard. Chron., 1875, I, 429. *Cyperorchis elegans*, Blume Rumph. IV, 47; Orch. Archip. Ind. 77, t. 48, C; Bot. Mag., 7007; Benth. in Journ. Linn. Soc. XVIII, 318; Hook. fil. Fl. Br. Ind. VI, 14. *C. densiflorum*, Griff. Notul. III, 337 (*the plant from Myrung only*).

Sikkim, at elevations of from 5,000 to 6,000 feet; in flower during October and November; Pantling, No. 14. Westward to Nepal and eastward to Bhutan. Khasia Hills, at 6,000 feet; Hooker, Collett, Mann. Naga Hills; Prain.

The flowers of this are usually of a pale lemon yellow, the lamellæ of the lip being of a cadmium yellow. Occasionally the sepals are flushed with pink or brown, and still more rarely the flowers are nearly white.

PLATE 259.—*Cymbidium elegans*, Lindl. Part of a plant; *of natural size.* Fig. 1 lip, 2 column with anther *in situ*, 3 under surface of anther, showing its interior, 4 pollinia; *all enlarged*, 5 capsule; *of natural size.*

14. CYMBIDIUM COCHLEARE, Lindl., in Journ. Linn. Soc., 28.

Pseudo-stem 3 to 6 in. long, stout. *Leaves* linear, finely acuminate, dilated at the equitant base; length 24 to 36 in., breadth ·4 to ·5 in. *Inflorescence* axillary, pendulous, much shorter than the leaves; the peduncle much longer than the raceme, with numerous lanceolate, acuminate, convolute, lax scarious sheaths 4 or 5 in. long;

the *raceme* with twelve to twenty imbricate *flowers* about 1·75 in. long, the stalked ovary ·75 to 1 in.; the *floral bract* triangular, minute. *Sepals* and *petals* sub-equal, not spreading, oblanceolate, blunt. *Lip* of the same length as the sepals and petals, oblong-oblanceolate in general outline; side lobes long, shallow, with triangular pointed apices; the apical lobe pubescent, sub-orbicular, undulate; upper surface with two smooth lamellæ united at their apices. *Column* slender, straight, with a few hairs at its base in front, rostellum projecting. *Anther* obovoid, beaked in front. *Pollinia* erect, sessile on a quadrate gland. *Capsule* broadly elliptic, tapering to each end, 1 in. long and ·6 in. in diam. *Cyperochis cochleare*, Benth. in Journ. Linn. Soc. XVIII, 318; Hook. fil. Fl. Br. Ind. VI, 15.

Sikkim, at elevations of from 4,000 to 6,000 feet; Hooker and others; Pantling, No. 352; in flower during October and November. Khasia Hills; Griffith, No. 5263 (Kew Distrib.). Assam; G. Mann.

The sepals and petals are of a dull brown flushed with green, the lip is ochraceous yellow minutely speckled with brown and the column is pale green.

PLATE 260.—*Cymbidium cochleare*, Lindl. Part of a plant; *of natural size.* Fig. 1 bract, stalked ovary, column and lip, in profile, 2 lip, 3 column; *of natural size*, 4 pollinia as they lie in the anther on the column, 5 pollinia removed, 6 empty anther, lower surface; *all enlarged.*

15. CYMBIDIUM MASTERSII, Griff. MSS. ex Lindl. in Bot. Reg., 1845, t. 50.

Pseudo-stem 2 to 12 in. long, sometimes branched. *Leaves* linear, acuminate and minutely and obliquely bifid at the apex, tapering towards the slightly expanded equitant base, length 12 to 24 in., breadth ·6 to ·7 in. *Inflorescence* axillary, from amongst the leaves, and only about half their length, erect; the peduncle much longer than the raceme, clothed to its apex by acuminate, lanceolate, convolute sheaths 4 or 5 in. long. *Raceme* somewhat decurved, 4 to 6 in. long, 4- to 6-flowered; *floral bract* triangular, minute, stalked ovary about ·5 in. long. *Flowers* crowded, 2 to 2·5 in. long. *Sepals* and *petals* sub-equal, oblong-lanceolate, about 2 in. long, the latter narrower than the sepals and with slightly recurved apices. *Lip* minutely pubescent, nearly as long as the petals, narrow, oblong; the side lobes long, shallow, erect, their apices acute and directed outwards; apical lobe sub-orbicular, undulate and irregularly crenate; the disc between the side lobes with two smooth lamellæ converging and ending at the base of the apical lobe. *Column* slender, slightly curved, with a small sac at the base, the rostellum projecting. *Anther* oblique, with a pointed lip. *Pollinia* erect, sessile on a quadrate gland. *Capsule* ellipsoid, 2·25 in. long. Lindl. in Gard. Chron., 1845, 643; Paxt. Fl. Gard. t. 78; Reichenbachia, t. 66. *C. micromeron*, Lindl. in Journ. Linn. Soc. III, 29. ? *C. affine*, Griff. Notul. III, 336; Ic. Plant. Asiat., t. 291, f. 3; Lindl. Journ. Linn. Soc. III, 28. *Cyperorchis Mastersii*, Benth. in Journ. Linn. Soc. XVIII, 318; Hook. fil Fl. Br. Ind. VI, 15.

Sikkim, at elevations of from 5,000 to 7,000 feet; in flower during October and November; Hooker and others; Pantling, No. 101. Khasia Hills; elevation 5,000 to 6,000 feet; Griffith, No. 5266 (Kew Distrib.), Hooker, Mann.

The prevailing colour in the flowers of this is white; the sepals and petals, especially toward their apices, being flushed with pink. The lip is yellowish externally and the lamellæ on its disc are orange-coloured. The column is greenish. The flowers are sweet-scented.

PLATE 261.—*Cymbidium Mastersii*, Griff. Part of a plant; *of natural size.* Fig. 1 bract, stalked ovary, column and lip, in profile, 2 lip, 3 vertical section of lip, 4 column; *of natural size*, 5 summit of column with the cap of the anther removed, 6 pollinia, 7 empty anther (*Nos. 5 to 7 enlarged*).

16. CYMBIDIUM EBURNEUM, Lindl. in Bot. Reg., 1847, t. 67.

Pseudo-stem short, stout. *Leaves* numerous, linear, the apex sub-acute and not notched, broad, sheathing and jointed near the base; length 12 to 24 in., breadth ·25 to ·5 in. *Scape* much shorter than the leaves, erect, clothed to the top with loose lanceolate, acuminate sheaths 2·5 to 5 in. long. *Flowers* only one or two, large, white, 3 to 4 in. across; the pedicel with ovary 1·5 in. long, exceeding the lanceolate acuminate bract. *Sepals* spreading, oblong, sub-acute, the dorsal concave. *Petals* like the sepals but sub-falcate. *Lip* oblong-obovate; the side lobe narrow, obtuse, the terminal lobe only slightly deflexed, short, sub-ovate, its edges undulate-crenulate; side lobes obscure, rounded, the disc between them with a broad pubescent 3-ridged yellow band; apical lobe broadly triangular, sub-acute, the edges undulate. *Column* long, thin, with a small sac at its base below the insertion of the lip. *Anther* truncately dome-shaped. *Pollinia* broad, sub-quadrate, erect, the rostellum projecting. *Capsule* broadly ellipsoid, ridged, 3 in. long and 1·5 in. in diam. Lindl. in Journ. Linn. Soc. III, 28; Bot. Mag., t. 5126; Paxt. Mag. Bot. XV, t. 145; Jennings' Orch., t. 16; Gartenflora, 1880, t. 155; Wien. Ill. Gartenz., 1887, t. 7 and 8; Gard. Chron., 1882, I, 497, f. 78; 1884, II, 77, f. 17; Hook. fil. Fl. Br. Ind. VI, 11. *C. syringodorum*, Griff. Notul. III, 338.

Sikkim, common between elevations of 1,000 and 3,000 feet; in flower during March and April; Pantling, No. 108. Westward to Nepal and eastward to Bhutan. Khasia Hills, at elevations of 3,000 to 4,000 feet; Griffith, G. Mann.

The prevailing colour in the flowers (which are very sweet-scented) is pure white. The ridge on the lip is, however, of a brilliant yellow, and there is a patch of the same colour on the apical lobe, while the column is tinged with pink.

PLATE 262.—*Cymbidium eburneum*, Lindl. Part of a plant; *of natural size.* Fig. 1 lip, 2 column with anther *in situ*, 3 summit of the column, showing the pollinia *in situ*, the cap of the anther having been removed, 4 empty anther, from behind, 5 capsule. *Figs. 1, 2 and 5 are of natural size, 3 and 4 are enlarged.*

39. Phalænopsis, Blume.

Epiphytic, without pseudo-bulbs and with very short stems. *Leaves* coriaceous, flat. *Inflorescence* from the side of the stem, or axillary, erect or pendulous. *Flowers* usually large, in loose racemes. *Sepals* and *petals* widely spreading. *Lip* clawed or sessile, adnate to the base or foot of the column, not spurred, more or less lobed, the side lobes erect, the apical lobe various; disc variously appendaged, usually with a forked plate or callus. *Column* sub-erect, with or without a foot. *Anther* 2-celled. *Pollinia* 2, obovoid, sulcate or bipartite, attached by a linear or spathulate caudicle to a large or small gland. Species about 32; Indian or Malayan.

Racemes erect, shorter than the leaves, 4- to 6-flowered; flowers white, apical lobe of lip reniform . . . . . 1. *P. Parishii.*
Racemes pendulous, as long as the leaves, many-flowered, flowers yellow, apical lobe of lip saggittate . . . . . 2. *P. Mannii.*

1. PHALÆNOPSIS PARISHII, Reichb. fil. in Gard. Chron., 1865, 410; 1871, 802;
var. *Lobbii*, Reichb. fil. in Saunders' Refug. Bot., t. 85.

Leaves broadly-elliptic, minutely and obliquely notched at the apex, 3 to 5 in. long and 1·25 to 1·75 in. broad. *Raceme* shorter than the leaves, 4- to 6-flowered, erect. *Flowers* ·8 to 1 in. across; *bract* elliptic, blunt, much shorter than the stalked ovary. *Sepals* sub-equal, orbicular-ovate, sub-acute. *Petals* smaller than the sepals, oblong-obovate, very blunt. *Lip* as long as the sepals, jointed, mobile, reniform, its lateral margins inflexed, bearing on its base a semi-circular erose flat disc with two superposed processes on its surface, each divided from about the middle into two awns. *Column* short, the base much dilated and with two large oblong erect basal lobes; rostellum long and narrow. *Anther* depressed. *Pollinia* obovoid-elliptic, attached by an elongated tapering flattened caudicle to a small triangular gland. Reichb. fil. Xen. Orch. II, 144, t. 156, fig. 1; Bot. Mag., 5815; Rolfe in Gard. Chron., 1886, II, 276; Hook. fil. Fl. Br. Ind. VI, 31.

Sikkim, in the valley of the Teesta, up to elevations of 1,200 feet, common; in flower during March and April; Pantling, No. 74. Bhutan, Cachar and Tenasserim, also in some parts of the Malayan Archipelago.

The form of this species which occurs in Sikkim is that which has been figured in Saunders' Refugium, t. 85, as var. *Lobbii*. It differs from the typical form only in having a white lip with two chestnut bands, whereas the typical form has amethyst bands. The rest of the flower is pure white, with the exception of the column which has a dash of yellow and two brown spots.

PLATE 263.—*Phalænopsis Parishii*, Reichb. fil. var. *Lobbii*, Reichb. fil. A plant, growing on a branch; *of natural size*. Fig. 1 a flower, 2 apex of ovary, bract, stalked ovary, column with anther *in situ* and lip, 3 the flat plate and 4-awned process from the base of the apical lobe of the lip, 4 column showing its basal processes, the stigma, and the anther *in situ*, 5 lower surface of empty anther, 6 apex of the column with the pollinia *in situ*, the cap of the anther having been removed, 7 pollinia after removal; *all enlarged*.

2. PHALÆNOPSIS MANNII, Reichb. fil. in Gard. Chron., 1871, 902; 1876, 503.

Leaves oblong-oblanceolate, obtuse, but with an abrupt minute apiculus, tapering to the sessile base, length 5 to 14 in., 2 to 4 in. wide at the widest part. *Raceme* about as long as the leaves, pendulous, sometimes branched, laxly many-flowered. *Flowers* 1 to 1·25 in. in diam.; *bract* ovate-lanceolate, acute, much shorter than the long-stalked ovary. *Sepals* unequal; the dorsal oblong, acute; the lateral broadly oblanceolate, sub-acute. *Petals* shorter than the sepals, oblong, acute, falcate. *Lip* shorter than the petals, adnate to the base and short foot of the column; the hypochile with two large erect truncate connivent lobes; mesochile with an erect 2-lobed callus situated at the base of the claw of the epichile; epichile broadly sagittate, the lobules wide-spreading, erose; the disc with a flattened sword-shaped appendage in front of the two awns, and the epichile with a few backward-directed setæ. *Column* with a short two-horned foot; rostellum much elongated. *Anther* broad. *Pollinia* obovoid-elliptic, attached by a long flat tapering caudicle to a small oblong gland. *Capsule* 4 in. long, narrowly clavate-ellipsoid, with six bold ridges. Rolfe in Gard. Chron., 1886, II, 276; Hook. fil. Fl. Br. Ind. VI, 30; in Ann. Bot. Gard., Calcutta, V, 37, t. 56.

Sikkim, in the valley of the Teesta, at low elevations, common; in flower during May; Pantling, No. 263. Assam.

The sepals and petals are yellow with bold horizontal and vertical brown markings, the lip is paler, more ochraceous than yellow, and the lobes of the mesochile are pink; the column is yellow, boldly marked with purple near the base.

PLATE 264.—*Phalænopsis Mannii*, Reichb. fil. A plant; *of natural size*. Fig. 1 a flower, 2 apex of ovary, column with its foot, anther *in situ* and lip, seen from the side, 3 lip, 4 longitudinal section of lip, 5 column, front view, 6 lower surface of empty anther, 7 apex of column, showing the rostellum and the pollinia *in situ*, the cap of the anther having been removed, 8 pollinia; *all enlarged*. 9 a capsule, 10 section of capsule; *of natural size*.

40. Doritis, Lindl.

Epiphytic, with short stems and no pseudo-bulbs. *Leaves* flat, coriaceous. *Inflorescence* and flowers as in *Phalænopsis*, but the column narrowly winged and the foot long and forming, with the sides of the lip, a conical sac bearing the lateral and apical lobes at its mouth. Species 5; Indian and Malayan.

Lip with a short wide spur; leaves oblong-oblanceolate, obtuse . . . . . 1. *D. Wightii*.
Lip with a long sub-cylindric spur, leaves narrowly elliptic-oblong, acute . 2. *D. tænialis*.

1. DORITIS WIGHTII, Benth. in Gen. Plant. III, 574.

Roots flat, much shorter than the leaves. *Stem* 1 in. long. *Leaves* about three, pendulous, oblong, slightly oblanceolate, the edges sub-undulate; the apex blunt, minutely and obliquely notched, gradually tapered to the sessile shortly sheathed base; length 6 to 8 in., breadth 1·35 to 2 in. *Inflorescence* pendulous from the stem beneath the leaves and shorter than them, slender below, somewhat thickened upwards, sometimes with a short branch. *Flowers* ·5 or ·6 in. long; *floral bract* ovate, acute, minute. *Sepals* unequal; the dorsal oblong-obtuse, blunt; the lateral pair shorter but broader, falcate, their apices obliquely truncate. *Petals* as long as the lateral sepals, oblong, blunt. *Lip* adnate to the foot of the column, the hypochile forming a conical sac with two erect very broad ridged fleshy truncate lobes; epichile obovate, narrow at the base, the apex broad and emarginate, its disc with a forked appendage. *Column* stout, shortly winged, the foot short. *Anther* depressed; rostellum long, narrow. *Pollinia* ovoid, attached by a curved flat tapering caudicle to a small triangular gland. Hook. fil. Fl. Br. Ind. VI, 32. *Phalænopsis Wightii*, Reichb. fil. in Bot. Zeit., 1862, 214. *Ærides latifolium*, Thwaites' Enum. Pl. Ceyl., 429.

Sikkim, in the valley of the Teesta, at low elevations; in flower during July; Pantling, No. 94. Assam; Jenkins. Bhutan; Lister. Burma; Parish. Coco Islands; Prain; also in Malabar and Ceylon.

The ground colour of the flowers is pale ochraceous yellow with purple markings on the lip and column. The bases of the petals and sepals are slightly mottled with pink.

PLATE 265.—*Doritis Wightii*, Benth. A plant; *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ*, and lip, seen from the side, 3 section of flower, 4 lip, 5 column with its foot, anther and stigma, 6 anther with the pollinia *in situ*, from below, 7 apex of column with the pollinia *in situ*, the cap of the anther having been removed, 8 pollinia, side view; *all enlarged*.

2. Doritis tænialis, Benth. in Gen. Plant. III, 574.

Roots numerous, long and flat, forming large tufts. *Leaves* few, pendulous, often solitary, sometimes absent, narrowly elliptic-oblong, acute, tapering to the sessile base; length 3 to 5 in., breadth ·6 to ·8 in. *Racemes* longer than the leaves, pendulous, 6- to 8-flowered. *Flowers* ·8 in. across; bract broadly triangular, minute. *Sepals* unequal, blunt; the dorsal oblong, slightly oblanceolate; the lateral pair broader, elliptic, blunt. *Petals* obovate, blunt, shorter than the sepals. *Lip* adnate to the foot of the column, shorter than the petals; hypochile produced below into a stout sub-cylindric spur, and sending upward two long narrow falcate backward-pointing lobes; the epichile spathulate-oblong, entire, attached to the hypochile near its base, running parallel to it for part of its length and then curving forwards, its upper surface with a forked appendage. *Column* long, narrowly winged, dilated towards the foot; the stigma large, the rostellum long and narrow. *Anther* depressed. *Pollinia* sub-globose, attached by a long curved tapering flat caudicle to a small triangular gland. Hook. fil. Fl. Br. Ind. VI, 31. *D. Braceana*, Hook. fil. in Ann. Bot. Gard., Calc., V, 40, t. 60. *Ærides tæniale*, Lindl. Gen. and Spec. Orch., 239; in Journ. Linn. Soc. III, 41. *Æ. carnosum*, Griff. Notul. III, 365; Ic. Plant. Asiat., t. 338A.

Sikkim, at elevations from 3,000 to 6,000 feet; in flower during May; Pantling, No. 82. Westward to Kumaon and eastward to Bhutan. Khasia Hills, Manipur, Burma.

The colour of the flowers is a delicate pale purple, the anther and epichile of the lip being dark purple. Specimens with white flowers are not uncommon; but, after fertilization has been effected, these change to yellow. In both the white and the purple-coloured flowers the column swells after fertilization and its margins close in.

Plate 266.—*Doritis tænialis*, Benth. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther *in situ* and lip, seen from the side, 3 longitudinal section of the foregoing, 4 epichile of lip, 5 lower surface of empty anther, 6 column with its foot, anther *in situ* and stigma, 7 apex of column with the pollinia *in situ*, the cap of the anther having been removed, 8 pollinia after removal; *all enlarged*

41. **Biermannia**, *new genus*, King and Pantling.

Epiphytal; *stem* very short. *Leaves* three or four, fleshy, linear. *Raceme* about as long as the leaves, few-flowered. *Sepals* sub-equal, ovate-lanceolate, the lateral pair attached to the base of the column. *Petals* shorter than the sepals. *Column* straight, with a short foot at right angles to itself. *Lip* attached at right angles to the foot of the column, as long as the petals, concave, fleshy, lobed or not, apex broad or sub-acute, the disc with two or more calli. *Stigma* large, orbicular. *Anther* depressed, apiculate, shortly beaked in front. *Pollinia* 2, orbicular or oval, attached by a subulate caudicle to a small gland. *Capsule* cylindric, ribbed, narrow. Two species; Sikkim and Khasia.

This genus is dedicated to the memory of Adolph Biermann, at one time Curator of the Botanic Garden, Calcutta. The only species at present belonging to it are *B. Khasiana*, published by us in the Journ. As. Soc., Bengal, for 1897, and the present plant which was originally published by us in the same Journal (Vol. LXIV, pt. 2, 340) under the name *Sarcochilus bimaculatus*. But as the genus *Sarcochilus* in the present work is defined exactly as we believe its author desired that it should be, this plant cannot be included in it; and, as its characters agree with those of no other genus, we have been obliged to form one for it reception.

Biermannia bimaculata, King and Pantling.

Stem very short. *Leaves* linear-oblong, narrowed to the base, sub-falcate, the apex obliquely bifid, 2 in. long, and ·35 in. broad. *Raceme* stout, ·75 in. long, compressed, and with persistent triangular bracts. *Flowers* confined to the upper half of the rachis, distichous, ·35 in. in diam.; *bract* broad, much shorter than the sessile ovary. *Sepals* sub-equal, ovate-lanceolate, apiculate, the lateral pair attached to the foot of the column. *Petals* shorter than the sepals, ovate, sub-acute. *Lip* springing at right angles from the short foot and lying parallel to the column; its side lobes narrow, elongate, falcate, erect, acuminate at the apex; apical lobe triangular, very fleshy and with two flat calli on its upper surface at the base where the side lobes end; the disc between the side lobes with larger elongate calli near its union with the foot. *Stigma* large. *Rostellum* short. *Pollinia* 2, ovoid, the caudicle oblanceolate; the gland very small, ovoid. *Capsule* 1·5 in. long, triquetrous. *Sarcochilus bimaculatus*, King and Pantling in Journ. As. Soc., Beng., Vol. LXIV, Pt. 2, 340.

Sikkim, in the valley of the Teesta, elevation about 1,500 feet; flowering in July; Pantling, No. 209.

The flowers are white with two blotches of brown on the calli of the lip. They open singly, smell of almonds, and are very fugacious.

Plate 267.—*Biermannia bimaculata*, King and Pantling. A plant; *of natural size.* Fig. 1 a flower, seen from the side, 2 bract, ovary, column with anther *in situ* and lip, side view, 3 sepals and petals, separated, 4 lip, 5 column with anther *in situ* and stigma, 6 pollinia, 7 capsule, 8 section of the capsule; *all enlarged.*

42. Ornithochilus, Wall.

Epiphytal, without pseudo-bulbs. *Stem* very short. *Leaves* few, softly coriaceous, broadly oblong, flat, crowded. *Inflorescence* supra-axillary, racemose or panicled. *Sepals* sub-equal, spreading, incurved at the apex; the lateral pair obliquely obovate. *Petals* much smaller, cuneate-oblong, blunt. *Lip* much longer than the sepals, adnate to the foot of the column by a long broad claw; the claw with a rectangularly bent sub-cylindric spur at its junction with the apical lobe; side lobes shallow, sub-quadrate; apical lobe with three lobules, the two lateral recurved and pectinate, the central triangular, entire and infolded; the mouth of the spur closed by two calli projecting from its back and front walls; the latter hairy. *Column* short, cylindric, stout, with a short foot; the rostellum forked; the *stigma* circular, surrounded by a hairy rim. *Anther* oblong. *Pollinia* 2, sub-globose; caudicle very broad, obcuneate, gland large. Species 1 or 2; Indian and Chinese.

Ornithochilus fuscus, Wall. in Lindl. Gen. and Spec. Orch., 242.

Leaves sub-acute, narrowed to the sessile sheathing base, 3 to 6 in. long and 1·5 to 2 in. broad. *Inflorescence* two or three times longer than the leaves. *Flowers* ·4 in. across; *floral bract* lanceolate, much shorter than the long-stalked ovary. *Capsule* fusiform, 1 in. long. Hook. fil. Fl. Br. Ind. VI, 76. *O. eublepharon*, Hance in Journ. Bot. XXII (1884), 364. *Ærides difforme*, Wall. in Lindl. Gen. and Spec. Orch., 242; Sert. Orch., *frontisp.* fig. 7; Reichb. fil. in Gard. Chron., 1865, 698; Lindl. in Journ.

Linn. Soc. III, 41; Walp. Ann. VI, 899. *A. Hystrix*, Lindl. in Journ. Linn. Soc. III, 42 (*not of Gen. and Spec. Orch.*)

Sikkim, at elevations from 4,000 to 6,000 feet; in flower during July and August; Pantling, No. 38. Westward along the range to Ghaiwal and eastward to Bhutan. Khasia Hills, Burma.

The ground colour of the flowers is greenish-yellow; the sepals and petals have bold bands of brown, and the pectinate lateral lobules of the lip are also brown passing into purple below.

PLATE 268.—*Ornithochilus fuscus*, Wall. A plant; *of natural size*. Fig. 1 a flower, side view, 2 vertical section of column spur and lip, 3 apical lobe of lip, 4 column with anther *in situ*, 5 anther, 6 and 7 pollinia before and after removal; *all enlarged*, (*Nos. 6 and 7 very much so*).

43. Luisia, Gaud.

Epiphytal, with rigid terete sheathed stems woody below, usually erect (pendulous in *L. volucris*). *Leaves* terete, fleshy, distant, spreading. *Flowers* usually small and dull in colour, in short extra-axillary spikes with stout axes; *floral bract* short, scarious, persistent. *Sepals* sub-equal or the depressed dorsal, smaller. *Petals* equal to the sepals or much longer, spreading. *Lip* sessile on the base of the column, divided into two parts; the hypochile saccate, concave or flat; and the epichile decurved, broad and ridged, entire or crenate, undulate, more or less blunt. *Column* much shorter than the lip, stout. *Stigma* usually large. *Anther* broad, 2-celled. *Pollinia* 2, ovoid or sub-globose, attached by a broad caudicle to a sub-quadrate or elongate gland. *Capsule* narrow, ridged, sub-erect. Species about 15; mostly tropical Asiatic, a few Australasian.

Sepals and petals sub-equal.	
Lip quite entire	1. *L. indivisa.*
Lip lobed.	
Flowers ·4 in. long; spikes 4- or 5-flowered	2. *L. trichorhiza.*
Flowers ·25 in. long; leaves 2·5 to 6 in. long	3. *L. teretifolia.*
Flowers ·15 in. long; leaves not exceeding 2·5 in. in length	4. *L. inconspicua.*
Petals two or three times as long as the sepals; flowers 1·75 in. long from tip to tip of the petals	5. *L. volucris.*

1. LUISIA INDIVISA, *new species.*

Stem 5 to 7 in. long, rather stout, not branching. *Leaves* rather long, slender, spreading, ·15 to ·2 in. thick, and 4·5 to 5·5 in. long, the internodes ·75 in. long. *Spikes* about ·2 in. long, 4- to 5-flowered. *Flowers* ·4 in. long; *floral bract* minute, triangular. *Sepals* sub-equal, oblong, blunt; the lateral pair somewhat broader and sub-cymbiform, not keeled. *Petals* narrowly oblong, falcate, sub-acute, slightly exceeding the dorsal sepal in length. *Lip* as long as the sepals, broadly oblong, quite entire except for two triangular indentations near the base, the apex sub-acute; the upper surface slightly concave at the base, the disc not furrowed. *Column* short, the *stigma* transversely elliptic.

Sikkim, at the base of the range, collected by C. A. B. Anderson; in flower during March; Pantling's Drawing No. 470.

The flowers of this species are pale green throughout. It is distinguished by its entire lip from all the Indian species of *Luisia*. Plants of it were sent in 1893 to the Botanic Garden, Calcutta, by the late Mr. C. A. B. Anderson. These flowered during the year 1896. Nobody else has as yet collected it.

PLATE 269.—*Luisia indivisa*, King and Pantling. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column and lip, 3 the petals, 4 lip, 5 column with anther and stigma; *all enlarged*.

2. LUISIA TRICHORHIZA, Blume Mus. Bot. Lugd. Bat. I, 63.

Stem 4 to 10 in. long, very stout, not branching. *Leaves* fleshy, only slightly tapered to the apex, ·2 in. thick and 4 to 7 in. long, the internodes ·4 in. long. *Spikes* 4- or 5-flowered, stout. *Flowers* ·4 in. long; *floral bract* broad, with an acuminate point, persistent. *Sepals* unequal; the lateral pair obliquely ovate, acute, keeled, longer than the blunt oblong dorsal one. *Petals* oblong, blunt, longer and narrower than the lateral sepals, all spreading. *Lip* larger than the sepals, the basal half deeply concave and with erect rounded edges, the apical half broadly cordate, tapering to the subtruncate minutely emarginate apex, the upper surface with short blunt vertical ridges. *Column* half as long as the lip, stout; the *anther* sub-quadrate, compressed, rostellum broad. *Pollinia* ovoid, attached by a broad tapering caudicle to the cuneate-quadrate gland. Lindl. Fol. Orch. 2; Reichb. fil. Xen. Orch., t. 77, figs. 8 to 18; Hook. fil. Fl. Br. Ind. VI, 23. *Vanda? trichorhiza*, Hook. Exot. Fl., Vol. I, t. 72.

Sikkim, at low elevations; in flower during March and April; Pantling, No. 205. Gharwal; Falconer.

This has much stouter stems and thicker and blunter leaves than either *L. brachystachys* or *L. teretifolia*. The flowers also are produced on short thick tubercles, and they are larger than in these two species. In colour they approach most to those of the former, the sepals being pale green with faint purple lines, and the lip dark dull purple, the basal portion or hypochile being faintly outlined by pale green lines, and the ridges of the apical half (epichyle) being tinged with the same shade of green.

PLATE. 270.—*Luisia trichorhiza*, Blume. A plant; *of natural size*. Fig. 1 the sepals and petals, separated; *of natural size*, 2 a flower, 3 bract, ovary, column with anther *in situ*, and lip in profile, 4 column (with the bases of the perianth) showing the anther *in situ* and the stigma, 5 lower surface of anther, 6 pollinia; *all enlarged*.

3. LUISIA TERETIOLIA, Gaud. Bot. Freyc. Voy., 426, t. 37.

Stem 6 to 12 in. long, stout, sometimes branching. *Leaves* terete, spreading, 2·5 to 6 in. long, and from ·15 to ·2 in. thick, the internodes ·6 in. long. *Spikes* very short, ·2 to ·3 in. long, 2- or 3-flowered. *Flowers* ·25 in. long; *floral bract* broad, pointed. *Sepals* and *petals* sub-equal, the petals slightly longer, narrowly oblong, blunt, spreading, the lateral pair ending in a tooth. *Lip* longer than the sepals and much broader, with a square sub-saccate base, and a deflexed rhomboid apical lobe with five or six vertical lines on its upper surface and a subtruncate apex. *Column* less than half as long as the lip, stout. *Anther* depressed. *Pollinia* 2, ovoid, attached by a stout caudicle to a broadly oblong gland. Blume Rumphia, IV, t. 194, fig. 3, t. 197D; Mus. Bot. Lugd. Bat. I, 63; Lindl. Fol. Orch., 2 (*excluding from all the synonym Ep. teriste*); Hook. fil. Fl. Br.

Ind. VI, 22. *L. brachystachys*, var. *flaveola*, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 144. *L. burmanica*, Lindl. Fol. Orch. 3. *L. platyglossa*, Reichb. fil. in Walp. Ann. VI, 622. *L. zeylanica*, Lindl. Fol. Orch., 3. *Cymbidium triste*, Roxb. Fl. Ind. III, 461; Bot. Mag., t. 3648; Wight Ic. 911 (*text only*); Griff. Notul. III, 340 (*the Mergui plant*). *C. tenuifolium*, Wight Ic. 1689 (*excl. text*).

Sikkim, in the bottoms of valleys, ascending to 3,000 feet; in flower during May; Pantling, No. 115. Khasia Hills, Bengal, Pegu and Tenasserim, Andamans, the Western Ghats and Ceylon.

The sepals and petals are of a uniform green and the lip and column of a deep purple, the anther is pale yellow. The plant, as found in the Bengal Sunderbans, has flowers coloured exactly as above described, but the stem and leaves are more slender and the ovaries are longer. Blume's two figures of this show larger flowers than we ever met with in British Indian specimens.

PLATE 271.—*Luisia teretifolia*, Gaud. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther and lip, side view, 3 column and anther, 4 empty anther, lower surface, 5 apex of column with pollinia *in situ*, the cap of the anther having been removed, 6 pollinia, after removal; *all enlarged*.

4. LUISIA INCONSPICUA, Hook. fil. MSS. in Herb. Hort. Calc.

Stem 4 to 6 in. long, slender, not branching. *Leaves* spreading, 1·4 to 2·5 in. long, ·1 in. in diam. or less, the internodes ·5 in. long. *Spikes* ·15 to ·2 in. long, slender, 1- to 3-flowered. *Flowers* ·15 in. long; *floral bract* membranous, triangular, acuminate. *Sepals* ovate-lanceolate, sub-acute, spreading. *Petals* oblong, tapering slightly to the blunt apex. *Lip* as long as the sepals, the basal part (hypochile) hemispherically saccate; the anterior part (epichyle) decurved, flat, sub-reniform, notched at the apex, its upper surface minutely hispid and with 5 or 6 vertical lines. *Column* half as long as the lip, stout. *Anther* depressed, rostellum large. *Pollinia* broadly ovoid, attached by a slender caudicle to an oblong-quadrate gland. *Saccolabium ? inconspicuum*, Hook. fil. Fl. Br. Ind. VI, 56. *Cymbidium inconspicuum*, Wall. MSS.

Sikkim, at low elevations; in flower during June and July; Pantling, No. 159. Assam (fig. in Herb. Bot. Gard. Calcutta); Jenkins, Simons.

This is a smaller and more slender plant than *L. teretifolia*, and it has smaller flowers, the prevailing colour in which is pale yellowish green, the column being purple and the basal half of the lip having spots of that colour. A coloured drawing of this was prepared in Dr. Wallich's time from a specimen sent from Assam by the late Colonel Jenkins. Dr. Wallich named it *Cymbidium inconspicuum*, and it was published by Sir Joseph Hooker in the Flora of British India as a doubtful species of *Saccolabium* under the name *S.? inconspicuum*. After seeing dried specimens of the plant from Sikkim, Sir Joseph saw that the plant is a *Luisia*, and he wrote on the Calcutta drawing the name here published.

PLATE 272.—*Luisia inconspicua*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 ovary, column and lip, in profile, 3 petals, 4 column with anther *in situ*, 5 empty anther, seen from below, 6 apex of column with the pollinia *in situ*, the cap of the anther having been removed, 7 pollinia; *all enlarged*.

5. Luisia volucris, Lindl., Fol. Orch., 1.

Pendulous; *stems* slender, 2 to 5 feet long, branching. *Leaves* inserted on one side only of the stem, rather slender, ·15 in. thick, and 6 to 8 in. long, internodes 2 in. long. *Spikes* rising half way between the leaves, ·5 in. long. *Flowers* 3 or 4, expanding only one at a time; *bract* broad, blunt, sheathing *Sepals* sub-equal, spreading, oblong, obtuse, the lateral pair concave towards the apex, all keeled on the midrib behind. *Petals* equalling the *sepals* in length at first, but lengthening to more than twice as long, linear, spathulate, widely spreading. *Lip* slightly longer than the sepals, the basal part (hypochile) cuneate-quadrate, auricled at the base, the edges upturned; the apical part (epichyle) decurved, oblong-cordate, narrowed to the rather broad emarginate apex, the edges crenate-undulate, and the upper surface with shallow broad vertical ridges. *Column* about half as long as the lip, broad, dilated opposite the large transversely oval stigma. *Anther* depressed, sub-quadrate. *Pollinia* oval, attached by a broad short caudicle to a transversely elongate gland. Walp. Ann. VI, 619; Hook fil. Fl. Br. Ind. VI, 25. *L. filiformis*, Hook. fil. Fl. Br. Ind. VI, 23. *L. Grovesii*, Hook. fil. l.c. 25.

Sikkim, at low elevations; in flower during March and April; Pantling, No. 122. Khasia Hills.

A species with pendulous habit, much resembling *Sarcanthus filiformis*, Lindl., the stems often attaining a length of as much as five feet. The sepals and petals are always of a pale green. The lip varies in colour, sometimes resembling the sepals and petals, but in other specimens being wholly of a dull dark purplish-brown. In the majority (as depicted in the figure) the epichyle is broadly margined with pale green.

Plate 273.—*Luisia volucris*, Lindl. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther *in situ*, and lip, 3 column with the anther *in situ* and the stigma, front view, 4 apex of column with the pollinia *in situ* (the cap of the anther having been removed), 5 pollinia after having completed their movement, 6 empty anther, from below; *all enlarged*.

44. Diploprora, Hook. fil.

Stem short, slender, pendulous. *Leaves* flaccidly fleshy, oblong-lanceolate, sessile; peduncle short, leaf-opposed, few-flowered. *Sepals* elliptic, keeled, spreading. *Petals* oblong, obtuse, reflexed. *Lip* as long as the petals, adnate to the base and also slightly to the sides of the column, cymbiform and sigmoidly curved; the hypochile concave, with recurved erect edges; the epichyle triangular, compressed and suddenly narrowed to the bicaudate apex, the disc with an erect keel. *Column* very short, with no foot. *Stigma* large. *Anther* conical, 2-celled. *Pollinia* 2, ovoid, bifid behind; caudicle short, flat; gland small, thin. *Capsule* narrow. The only species.

This genus is allied to *Luisia* and *Vanda*, from both of which it differs in the suddenly contracted, laterally compressed, apically bifid epichyle of its lip. From *Luisia* it is at once distinguished by having flat instead of terete leaves. When dried the leaves appear to be membranous in texture; they are, however, not really so when alive. On the contrary, they are then thick and almost coriaceous. The plump appearance is due to the presence of much water in their tissues, the removal of which by drying gives rise to their membranous appearance in the Herbarium. As far as texture of leaves goes, this plant might be a *Vanda* or *Arachnanthe*, and its separation from these genera depends on the peculiarities of the lip.

DIPLOPRORA CHAMPIONI, Hook. fil. Fl. Br. Ind. VI, 26; Ic. Plant., t. 2020.

Stem 3 to 6 in. long. *Leaves* flaccidly fleshy, acute, slightly narrowed at the rounded base, 2·5 to 3·5 in. long, and ·6 to ·75 in. broad. Peduncle ·5 to 1 in. long, ending in a short 3- to 4-flowered flexuose undulate raceme. *Flowers* ·75 in. across; *floral bract* short, ovate, keeled. *Petals* narrower than the *sepals*. Hypochile of the *lip* attached to the lower part of the sides of the column. *Column* very short and broad. *Stigma* large, caudicle of *pollinia* bent. Hook. fil. Fl. Br. Ind. VI, 26. *Cottonia Championi*, Lindl. in Hook. Journ. Bot. VII (1853), 35; in Journ. Linn. Soc. III, 39; Benth. Fl. Hongkong, 357. *Luisia bicaudata*, Thwaites' Enum. 302. *Vanda bicaudata*, Thwaites, l. c. 429.

Bhutan, above Engo, elevation about 2,000 feet; Gammie; Pantling, No. 284; in flower during July and August. Khasia Hills; elevation 3,000 to 4,000 feet; Hooker and Thomson. Assam, Mikir Hills; Simons, G. Gammie. Ceylon; Thwaites. Hongkong; Hance.

The sepals and petals of this are yellow; the lip and column white, the latter being marked with cinnamon-brown.

PLATE 274.—*Diploprora Championi*, Hook. fil. A plant; *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther *in situ* and lip, in profile, 3 front view of column, with anther *in situ*, showing the stigma and rostellum, 4 apex of column with pollinia *in situ*, the cap of the anther having been removed, 5 empty anther from below, 6 pollinia; *all enlarged*.

45. Stauropsis, Reichb. fil.

Epiphytal; *stem* stout, rigid, leafy. *Leaves* coriaceous, flat or keeled, spreading, bilobed at the apex. *Racemes* extra-axillary. *Sepals* and *petals* widely spreading, spathulate-lanceolate or obovate, the latter smaller than the former. *Lip* smaller than the sepals and petals, adnate to the base of the column, channelled, its basal part (hypochile) concave, prominently auricled; the mesochile contracted, and the epichyle thickened, laterally compressed and concave, the disc with two long glabrous or hairy ridges. *Column* short, stout, without any foot, truncate at the apex. *Anther* depressed. *Pollinia* 2, sub-ovoid, plano-convex, bipartite on the posterior surface, attached by a caudicle to a large gland. Species about 6; Indo-Malayan.

A genus differing from *Vanda* chiefly by its lip, which is neither saccate nor spurred at the base, but which is concave and auricled, the mesochile being narrowed and the epichyle thickened and concave. The sepals and petals also are less narrowed at the base than those of *Vanda*.

STAUROPSIS UNDULATA, Benth. ex Hook. fil. in Fl. Br. Ind. VI, 27.

Stem 8 to 14 in. long, erect, minutely warted like the peduncle. *Leaves* narrowly oblong, blunt, retuse, not tapering at the base, 3 or 4 in. long, and ·75 in. broad. Peduncle leaf-opposed, stout, rigid, diverging, with a few distant short sheaths 6 to 8 in. long; *raceme* lax, few-flowered, 2 to 3 in. long. *Flowers* 1·5 in. across. *Sepals* and *petals* with very wavy edges, all more or less reflexed. *Lip* adnate to the base only of the column; the auricles of the hypochile large, rounded, erect, embracing the column, mesochile short, epichyle concave, disc with two ridges running from the base nearly

to the apex. *Column* very short and stout. *Stigma* large, sub-orbicular. *Pollinia* ovoid, attached by a slender caudicle to an orbicular gland. Hook. fil. Fl. Br. Ind. VI, 27; Ann. Roy. Bot. Gard., Calcutta, Vol. V, 36, t. 55; *Vanda undulata*, Lindl. in Journ. Linn. Soc. III, 42; Reichb. fil. in Gard. Chron., 1875, I, 202; id. 1878, I, 168.

Sikkim, at elevations from 5,000 to 7,000 feet; in flower during April and May; Pantling, No. 72. Bhutan, Khasia Hills.

The sepals and petals are fleshy in texture and white in colour, flushed with pink and sometimes tipped with green. The lip is yellowish-green striped with pink. The peduncle, the rachis of the raceme, and the young shoots are green, spotted with purplish-brown.

PLATE 275.—*Stauropsis undulata*, Benth. A plant; *of natural size*. Fig. 1 a flower, 2 column with anther *in situ* and stigma, 3 empty anther, under surface, 4 pollinia, front view, 5 the same, back view; *all enlarged*.

46. Sarcochilus, R. Brown.

Epiphytal. *Stem* none or very short. *Leaves* narrowly oblong or absent. *Flowers* usually in pendulous racemes. *Sepals* and *petals* sub-equal, free, spreading; the dorsal sepal concave, the lateral pair broader and partly adnate to the foot of the column. *Lip* jointed or adnate to the long produced foot of the column, without a spur; the side lobes very large, erect; the apical lobe minute, tooth-like; the disc with hairy ridges and calli. *Column* thick, shorter than its foot, wingless, rostellum short. *Anther* terminal, depressed, shortly beaked in front, sometimes bearing two lateral setæ. *Pollinia* four, in pairs, compressed; the caudicle slender, flattened, the gland small. Species probably about ten, Indian and Australian.

The genus *Sarcochilus*, as reconstituted by Bentham, embraces the *Sarcochilus* of Robert Brown and of so much else besides that it is difficult to know what its limits are. Sir Joseph Hooker, in his Flora of British India, adopts the Benthamian genus, but characterises it as "a polymorphous one, no doubt to be dismembered when better known." And in the Botanical Magazine (sub. t. 7044) he remarks as follows:—

"*Sarcochilus*, as reconstituted in the '*Genera Plantarum*,' consists of a very difficult group of thirty or forty Indian, Malayan, Australian, and Pacific Island orchids differing greatly in habit, and out of which some eight or ten genera" (thirteen are given in the Index Kewensis) "had been differentiated." * * * "For this enlarged genus Reichenbach filius proposed to adopt the name of *Thrixspermum*, Loureiro (1790), as being anterior to *Sarcochilus*, Brown (1810), a course which Bentham did not adopt in the '*Genera Plantarum*,' on the very sufficient grounds that the name is utterly bad in construction, and because the description of the latter is so incomplete that it would have been impossible to recognise the plant intended by it, but for a scrap contained in Loureiro's Herbarium preserved in the British Museum. On the other hand, *Sarcochilus* has been recognised by all authors for three-quarters of a century, and many species have been described under that generic name."

Of the species described under *Sarcochilus* in Hooker's Flora of British India, six are natives of Sikkim, viz., (1) *S. suaveolens*, H. f.; (2) *S. obtusus*, Benth.; (3) *S. Mannii*, H. f.; (4) *S. hirtus*, Benth.; (5) *S. Arachnites*, Reichb. fil.; and (6) *S. luniferus*, Reichb. fil. Of these six, the last (*S. luniferus*) is the only one which has the characters of the genus as we believe Robert Brown originally constituted it, and which occur in the only species which he described, viz. *S. falcatus*. These characters are the presence in the lip of two very large side lobes and of a very short anterior lobe, together with the total absence of a spur. The other five Sikkim species attributed to *Sarcochilus* in the Flora of British India we have disposed of as follows:—For *S. suaveolens* we have revived the genus *Ornitharium* which Lindley provided for the plant when it first came under his notice, the very peculiar

lip of this plant excluding it, in our opinion, from any other genus. For *S. obtusus* and *S. Mannii* we have re-established the Lindleyan genus *Camarotis* (to which the former originally belonged under the name *Camarotis obtusa*). The characters which make the revival of *Camarotis* necessary are the dorsal position of the anther, the shape and direction of the enormously developed rostellum, and the form of the lip. For *S. hirtus* we retain the genus *Stereochilus* which Lindley originally founded for it; and we have transferred, for reasons given under our description of the species, to the same genus the plant described in the Flora of British India as *Cleisostoma bicuspidatum*. *Stereochilus* has a spurred lip; the middle lobe is large and the lateral lobes are very small; the anther is terminal and the rostellum at right angles to the column—characters which exclude it from the *Sarcochilus* of Brown. Finally, we have, on account of the conspicuous spur, the small size of the side lobes, and the comparatively large size of the apical lobe—but above all on account of the fact that the lip is jointed to the column—restored *S. Arachnites* to Blume's genus *Dendrocolla*.

Leafless; racemes pubescent, many-flowered	1. *S. luniferus.*
Leafy; racemes glabrous, with only two to three flowers	2. *S. pygmæus.*

1. Sarcochilus luniferus, Benth. MSS. ex Hook. fil. in Bot. Mag., t. 7044.

Roots numerous, elongated, flattened and greenish in colour. *Stem* and *leaves* absent. *Inflorescence* pendulous, pubescent, 3 to 15 in. long; the peduncle short and with a few minute distant bracteoles; the *raceme* many-flowered, lax. *Flowers* almost sessile, ·5 in. across; *bract* membranous, ovate-lanceolate, almost equalling the sub-sessile pubescent ovary. *Sepals* unequal, the dorsal ovate, blunt, concave and over-arching the column; the lateral pair ovate-rotund, blunt, spreading. *Petals* broader than the sepals, sub-quadrate, truncate. *Lip* parallel to the column and jointed to its long foot, forming a deep triangular pouch and having very large erect obliquely oblong blunt glabrous side lobes; the apical lobe reduced to a small knob. *Column* short, thick, its foot longer than itself but not so fleshy. *Anther* dome-shaped, rather depressed, bearing two long decurved lateral setæ. *Pollinia* four, orbicular in outline, unequal, compressed, attached by a slender cylindric caudicle to a small thick gland. Hook. fil. Fl. Br. Ind. VI, 37. *Thrixspermum luniferum*, Reichb. fil. in Gard. Chron. 1868, 786.

Sikkim, in tropical valleys; in flower during May; Pantling, No. 66. Burma; Falconer, Brandis, Kurz.

The sepals and petals of this are yellow with large brown spots; the lip is also yellow with broad bands of brown, and the column has two bands of brown below the stigma. In the structure of its flowers this exactly agrees with *Sarcochilus falcatus*, R. Brown, as figured by Fitzgerald in his Orchids of Australia, part 5. Brown's generic description is a very brief one, and contains nothing that does not fit this plant, which without hesitation we refer to *Sarcochilus*, as Brown defined it.

Plate 276.—*Sarcochilus luniferus*, Benth. A plant in flower and fruit; *of natural size*. Fig. 1 a flower, 2 bract, ovary, column and lip, *side view*, 3 the lip, looked at from the base, the top having been cut off, 4 longitudinal section of column and lip, 5 column, *front view*, showing the anther with its setae and the stigma, 6 the under surface of the anther with the pollinia *in situ*, 7 the pollinia, *front and back views; all enlarged.*

2. Sarcochilus pygmæus, *new species.*

Stem 1 in. long, pendulous. *Leaves* two or three, fleshy, linear-oblong, acuminate, their apices entire; length 2·5 in., breadth ·35 in. *Racemes* one or two, glabrous, their

Sikkim, at elevations of from 6,000 to 8,000 feet; in flower during November; C. B. Clarke. Pantling, No. 20. Bhotan; Gammie and Lister.

This so closely resembles *A. Cathcartii* that the two are indistinguishable except when in flower. The leaves of this are slightly firmer than those of *A. Cathcartii*. The colour of the posterior surface of all the pieces of the perianth is white; that of the anterior is gamboge-yellow with broad but unequal rich chestnut-brown bands, the lip being horizontally striped with the same tint of brown. The column is white, speckled in front and flushed behind with pink; the anther is yellow, but its apex is tipped with pink.

PLATE 279.—*Arachnanthe Clarkei*, Rolfe. Part of a plant, *of natural size*. Fig. 1 lip, 2 stalked ovary, column with anther *in situ*, and lip, 3 section of lip to show the infundibuliform hollow in its substance, 4 column with anther and stigma, 5 pollinia with caudicle (*c*) and gland (*g*), 6 the same from behind, 7 empty anther—*all enlarged*, 8 fruit; *of natural size*.

3. ARACHNANTHE BILINGUIS, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 573.

Stem stout, woody, enveloped in the bases of fallen leaves, probably pendulous. *Leaves* coriaceous, keeled, close together, linear-oblong, blunt, unequally bilobed, not narrowed at the sheathing base, 6 to 9 in. long and about ·8 in. broad. *Raceme* as long as or longer than the leaves, sometimes branching; the peduncle and rachis slender, the latter with distant short tubular sheaths. *Flowers* distant, ·85 to 1·5 in. across; *floral bract* broad, blunt, scarious, much shorter than the peduncled ovary. *Sepals* sub-equal, oblong-oblanceolate, blunt. *Petals* slightly smaller, oblong, acute. *Lip* shorter than the petals, sagittate in general outline, shortly clawed, the basal auricles shallow; the blunt apex with a large papilla just behind it on the under surface, and a blunt recurved cylindric spur between the papilla and the base, the spur equal in length to the column; upper surface convex, with six narrow pink ridges. *Column* stout, curved. *Anther* conical, its apex blunt; *pollinia* globose, attached to the apex of a triangular caudicle, the gland very thick. Hook. fil. Fl. Br. Ind. VI, 28. *Renanthera bilinguis*, Reichb. fil., Xenia Orchid. I, 7, t. 4. *R. labrosa*, Reichb. fil. l. c. 88. *Arrhynchium labrosum*, Lindl. in Paxt. Fl. Gard. I, 42.

Bhotan near the Sikkim frontier in the Rumpti Valley at a low elevation; J. L. Lister, Pantling, No. 183; in flower during August. Khasia Hills; Assam, Simons.

The sepals and petals are pale yellow with dark brown markings; the lip, at first white, afterwards becomes yellow and has pink lines on its ridges and bright blotches of the same colour on its basal auricles.

PLATE 280.—*Arachnanthe bilinguis*, Benth. A plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ*, and lip with its spur, 3 section of lip, 4 pollinia; *all enlarged*.

48. Ærides, Lour.

Epiphytic, with leafy stems. *Leaves* coriaceous, linear or terete. *Flowers* usually numerous and brightly coloured, in decurved racemes, sometimes solitary; the *floral bract* minute. *Sepals* and *petals* broad, spreading, the lateral sepals adnate to the base or foot of the column. *Lip* adnate to the column, spurred; the side lobes large or small,

sometimes absent; the mid-lobe larger than the side lobes, or smaller and incurved. *Column* short, its foot short or long; rostellum short or long and bifid. *Anther* 2-celled, with or without a beak; *pollinia* two, globose, sulcate; caudicle long or short; gland various. Species about 50; Eastern Asiatic.

Leaves terete	1. *Æ. longicornu.*
Leaves flat, keeled—	
Apical lobe of lip small, narrowly oblong	2. *Æ. odoratum.*
Apical lobe of lip large and hastate, acute	3. *Æ. multiflorum.*

1. ÆRIDES LONGICORNU, Hook. fil. Ic. Plant. 2127.

Stem slender, elongate, pendulous. *Leaves* terete, 4·5 to 7 in. long and about ·1 in. thick. Peduncle extra-axillary, very slender, 1- to 2-flowered, 1·25 to 2 in. long. *Flowers* 1·25 in. long. *Sepals* oblong; the dorsal erect, apiculate; the lateral pair spreading, sub-falcate, flexuose. *Petals* as large as the dorsal sepal, oblong, tapering somewhat towards the blunt apex, the edges much undulate. *Lip* adnate to the long foot of the column, consisting chiefly of an elongated narrowly infundibuliform spur curving slightly forwards, its mouth with two unequal hooked linear acute lateral lobes on each side; the apical lobe oblong, decurved, slightly dilated and cuneiform at the apex. *Column* short, the foot much longer. *Anther* shortly beaked; *pollinia* globose; caudicle filiform, dilated at the apex; the gland small, oblong. *Capsule* narrowly cylindric, ridged, 1·75 in. long. Hook. fil. Fl. Br. Ind. VI, 44. *Mesoclastes uniflora*, Lindl. in Wall. Cat. 1993; Gen. and Spec. Orch 45. *Luisia uniflora*, Blume Rumph. IV, 50; Mus. Bot. Lugd. Bat. I, 64; Lindl. Fol. Orch. 3.

At Dumsong, in Bhotan, elevation 5,500 feet; Pantling No. 350; in flower during September. Nepal; Wallich. Upper Assam, in the Naga Hills, at an elevation of 5,500 feet; Clarke.

The flowers are white with a flush of pink on the spur; they are inodorous. The species appears to be to a great extent self-fertile. Mr. Pantling, who kept living plants of it under observation, recorded the following note on this point:—

"The contraction after removal of the dilated portion of the caudicle immediately below the pollen masses, and the backward movement of the masses to a right angle, suggest that these phenomena are arrangements for securing self-fertilization. Moreover, the main portion of the caudicle is so very slender and the pollinia and anther are so delicately attached to the column that the whole becomes easily influenced either by the force of the wind, or by the jar caused by the leaves striking against the flowers. On dislocation taking place, the masses hang as by a thread in front of the stigmatic cavity, and in that position very little is needed to bring them in contact with the viscid surface of the stigma, and so to effect self-fertilization. Of seven flowers which opened near my house, all were thus self-fertilized."

Specimens of this from the Khasia Hills, as figured by Sir J. W. Hooker in his *Icones Plantarum*, have the apical lobe of the lip more dilated and slightly bifid than those from Sikkim as figured here.

PLATE 281.—*Ærides longicornu*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, 2 section of column and its foot and of the lip, 3 column and foot with anther *in situ*, front view, 4 apex of column with the pollinia *in situ*, the cap of the anther having been removed, 5 pollinia shortly after removal, the bending of the caudicle having been completed, 6 empty anther seen from below; *all enlarged*.

2. Ærides odoratum, Lour. Fl. Coch. Ch., 525.

Stem very stout. *Leaves* flat, keeled, oblong, tapering somewhat to the blunt unequally and obtusely bilobed apex, not contracted at the sheathing base; length 6 to 12 in., breadth 1 to 1·75 in. *Racemes* supra-axillary, deflexed, as long as or longer than the leaves, many-flowered; the peduncle short, stout, with short distant sheaths. *Flowers* 1 in. long and about ·8 in. wide; *floral bract* broad, sheathing, blunt, much shorter than the stalked ovary. *Sepals* unequal, spreading; the dorsal broadly elliptic-ovate, blunt; the lateral pair somewhat larger, blunt. *Petals* oblong, falcate, shorter than the sepals. *Lip* adnate to the short foot of the column; the spur large, infundibuliform, curved forwards; the lateral lobes very shallow, truncate, erose; apical lobe linear, its margin emarginate or erose, lying between the edges of the lateral lobes. *Anther* triangular, depressed, beaked; *pollinia* globose; caudicle linear, gland quadrate. *Capsule* fusiform, 1·25 in. long. Lindl. Gen. and Spec. Orch. 239; in Journ. Linn. Soc. III, 41; Bot. Mag. 4139; Walp. Ann. VI, 898; Lindenia, t. 14 (var.); Hook. fil. Fl. Br. Ind. VI, 47. *Ærides cornutum*, Roxb. Hort. Beng. 63; Fl. Ind. III, 472; Bot. Regist., t. 1485.

Sikkim, common along the base of the range and ascending to 3,000 feet; in flower during May and June; Pantling, No. 443. Westward to Nepal. In the Khasia Hills, Sylhet, Chittagong and Burma; also in Cochin China, China and Java.

The flowers are very fragrant. The prevailing colour in them is white with numerous pink spots.

Plate 282.—*Ærides odoratum*, Lour. A plant, *of natural size*. Fig. 1 a flower, 2 apical lobe of the lip, 3 the column with its foot and the anther *in situ*, 4 anther seen from below, 5 pollinia; *all enlarged*.

3. Ærides multiflorum, Roxb. Corom. Pl. III, 63, t. 271.

Stem 4 to 10 in. long, stout. *Leaves* narrowly oblong, conduplicate, recurved, slightly tapered to the oblique bifid apex, not narrowed to the base, frequently flushed with a reddish tinge; length 6 to 10 in., breadth ·75 to 1·25 in. *Racemes* longer than the leaves, simple, axillary, densely many-flowered; the peduncle long and with distant short sheaths. *Flowers* ·75 in. in diam. *Sepals* and *petals* sub-equal, oblong, blunt. *Lip* twice as long as the sepals, entire, triangular, adnate to the base of the column, the margins erose, the apex acute or blunt; its basal half thick and with a retrorse tooth or callus pointing across the mouth of the rectangularly bent spur. *Column* with its margins thickened and slightly winged near the base, foot none. *Anther* depressed and with a long curved beak in front; *pollinia* globular, caudicle filiform, gland very narrow. Roxb. Flora Indica, III, 475; Belg. Hortic. 1876, 286; Reichb. fil. in Walp. Ann. VI, 897; Hook. fil. Fl. Br. Ind. VI, 44. *Æ. affine*, Wall. Cat. 7316; Lindl. Gen. and Spec. Orch. 239; Sert. Orchid., t. 15; in Journ. Linn. Soc. III, 41; Bot. Mag., t. 4049; Warner Sel. Orch. Ser. I, t. 21. *Æ. roseum*, Lodd. ex Paxt. Fl. Gard. II, 109, t. 60; Regel Gartenflora VIII, 253, t. 267. *Æ. Lobbii*, Hort. ex Ill. Hort. 1868, t. 559. *Æ. Veitchii*, Hort. ex Morven in Belg. Hortic. 1876, 291. *Æ. trigonum*, Klotzch in Otto and Diet. Allgem. Gartenz, 1855, 177.

Sikkim, in tropical valleys; in flower during April; Pantling, No. 446. Assam; G. Mann.

The ground colour of the flowers is white, but they are freely marked with pink or purple. The species is closely allied to *Æ. Fieldingii*, Lodd., but that is a more robust plant and has wider leaves, which are flat. Its flowers, moreover, are rather larger. *Æ. Fieldingii* has not been recorded from Sikkim.

PLATE 283.—*Ærides multiflorum*, Roxb. A flowering plant, *of natural size*. Fig. 1 a flower, 2 side view of bract, stalked ovary, column and lip, 3 lip showing the callus (*c*) at the point of insertion on the column, 4 column, 5 empty anther, 6 pollinia; *all enlarged*.

49. Rhynchostylis, Blume.

Epiphytic. *Stem* elongate, stout, leafy. *Leaves* very coriaceous, linear-oblong, truncately or bluntly bilobed at the apex. *Racemes* pendulous, many-flowered. *Flowers* brightly coloured. *Sepals* and *petals* spreading, broad, obtuse, the petals narrower than the sepals. *Lip* adnate to the short foot of the column, the hypochile forming a deep wide pubescent sac without side lobes; the epichile obovate, acute, concave, the margins erect. *Column* short, stout, dilated at the base and with a very short foot. The stigma small. *Anther* terminal, rounded; *pollinia* two, elliptic, attached by a slender long caudicle to the small oblong gland. Species two or three, Malayan and Indian.

RHYNCHOSTYLIS RETUSA, Blume Bijdr. 286, t. 49.

Stem stout, clothed in the sheaths of decayed leaves, 4 to 8 in. long. *Leaves* curved, keeled, præmorse or bluntly bilobed; length 6 to 18 in., breadth about 1 in. *Racemes* longer than the leaves, cylindric, densely-flowered, the peduncle short with a few small scattered sheaths. *Flowers* ·75 in. across, the spur compressed, equal in length to the lip. Lateral *sepals* broadly ovate, obtuse or apiculate, the dorsal oblong. *Capsule* clavate, 1 to 1·5 in. long. Hook. fil. Fl. Br. Ind. VI, 32. *R. præmorsa*, Blume Bijdr. 286. *R. guttata*, Reichb. fil. in Bonplandia II, 93. *R. garwalica*, Reichb. fil. in Walp. Ann. VI, 888. *Saccolabium guttatum*, Lindl. in Wall. Cat. 7308; Gen. and Spec. Orch. 220; in Journ. Linn. Soc. III, 32; Bot. Mag., t. 4108; Wight Ic. tt. 1745-6; Dalz. and Gibs. Fl. Bomb. 263; De Vriese Orch. t. 14; Griff. Ic. Pl. Asiat. Notul. 22, t. 8 and 9. *S. præmorsum*, Lindl. Gen. and Spec. Orch., 221. *S. Rheedii*, Wight Ic. V, 19. *S. retusum*, Flore des Serres, tt. 1463-4. *S. Heathii*, Hort. ex Gard. Chron. 1885, II, 369. *S. Blumei*, Lindl. Sert., t. 47; in Bot. Reg. 1841, misc. 55. *S. gurwalicum*, Lindl. in Journ. Linn. Soc. III, 32; in Gard. Chron. 1879, II, 102. *Sarcanthus guttatus*, Lindl. in Bot. Reg., t. 1443. *Ærides guttatum*, Roxb. Fl. Ind. III, 471; Regel Gartenflora, 1863, 415. *Æ. retusum*, Swartz in Schrad. Dar. 1799, 130; Willd. Sp. Plant. IV, 130; Grah. Cat. Bomb. Pl. 204. *Æ. spicatum*, Don Prod. Fl. Nep. 31. *Æ. præmorsum*, Willd. l. c.; Grah. Cat. Bomb. Pl. 264. *Limodorum retusum*, Swartz in Nov. Act. Upsal. VI, 80. *Epidendrum retusum*, Linn. Sp. Plant, 953.

Sikkim, common in tropical valleys and ascending to 3,500 feet; Pantling, No. 442; along the base of the Himalaya westward to Gharwal and eastward to Bhotan. In Assam, the Khasia Hills, Burma, Southern India, Ceylon and the Malayan Archipelago.

The flowers are white or pink, variously marked with purple or violet. The hypochile of the lip forms a sac varying in length; the epichile also varies in shape,

being sometimes cuneiform; moreover, its disc is in some specimens flat, in others channelled. The plant is widely distributed and local varieties have been too freely treated as species. There is considerable divergence also as to time of flowering. The form here figured is that found in Sikkim.

PLATE 284.—*Rhynchostylis retusa*, Blume. A plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ*, and spurred hypochile, *seen from the side*, 3 section of spur, 4 lower surface of anther, 5 column with anther *in situ*, 6 pollinia; *all enlarged*.

50. Vanda, R. Brown.

Epiphytes with leafy stems. *Leaves* thickly coriaceous or fleshy, flat and keeled or terete. *Racemes* axillary. *Flowers* large and usually handsome, in simple lax or dense racemes, sometimes solitary; the *floral bract* much smaller than the ovary. *Sepals* and *petals* sub-equal, spreading or connivent, narrowed at the base. *Lip* large, with its base usually saccate or spurred; the side lobes large or small (rarely absent), adnate to the short foot of the column or to the sides of the sac or spur; apical lobe fleshy, varying in shape, its disc usually ridged or lamellate, sometimes carunculate. *Column* short, stout, without a foot or with only a short one. *Anther* 2-celled; rostellum small; *pollinia* two, didymous, globose-obovoid or broadly ovoid; the caudicle broad and short, or long and geniculate; gland usually large. Species about 30, tropical Asiatic and Australian.

Leaves terete	1. *V. teres.*
Leaves narrowly oblong, keeled.	
Lip spurred at the base.	
Apical lobe of lip oblong, carunculate, not ridged, its apex broadly emarginate or minutely bilobed	2. *V. parviflora.*
Apical lobe of lip boldly ridged and carunculate; its apex with two divaricating lobules and with a downward pointing horn .	3. *V. cristata.*
Apical lobe ridged but not carunculate, its apex sub-truncate . .	4. *V. pumila.*
Lip gibbous, but not spurred or saccate at the base	5. *V. alpina.*

1. VANDA TERES, Lindl. in Wall. Cat.; Gen. and Spec. Orch., 217.

Stem 2 to 8 feet long, sub-scandent, slender, branched, smooth, naked. *Leaves* fleshy, terete, tapering to the sub-obtuse apex, 4 to 8 in. long and as thick as a goose-quill. Peduncle extra-axillary, slender, longer than the leaves, sub-erect, bearing a few short bracts; *raceme* 2- to 6-flowered. *Flowers* 2·5 to 3 or even 4 in. across. Dorsal *sepal* broadly elliptic, rotund or obovate, blunt; the lateral pair broadly oblong or obovate, falcate, obtuse, somewhat undulate. *Petals* larger than the lateral sepals, sub-rotund, wide-spreading. *Lip* longer than the sepals, adnate like the lateral sepals to the very short foot of the column; spur infundibuliform, puberulous inside, the mouth very wide, with large rounded obliquely elliptic side lobes; the apical lobe clawed, obovate, deeply bifid. *Column* short with a broad base and a very short foot, pubescent in front. *Anther* with a long apical beak, depressed. *Pollinia* broadly ovoid, bifid; caudicle stout, tapered to the large reniform or cordate gland. *Capsule* narrowly fusiform, 2·5 in. long. Lindl. in Wall. Cat. 7324; Gen. and Spec. Orch. 217; Fol. Orch. 7; in Bot. Reg.

t. 1809; Bot. Mag., t. 4114; Paxt. Mag. Bot. V, t. 193; Griff. Notul. III, 353; Warn. Sel. Orch. Ser. III, t. 2; Reichenbachia, I, t. 27; Hook. fil. Fl. Br. Ind. VI, 49. *Dendrobium teres*, Roxb. Fl. Ind. III, 485.

Sikkim, common in the Terai and occasionally found in very hot valleys; in flower during March and April; Pantling, No. 45. Assam, Sylhet, Khasia Hills, Chittagong and Upper Burma, Andaman and Nicobar Islands.

The sepals and petals are rose-coloured, as are the side lobes and apex of the lip. The spur is yellow or ferruginous, boldly lined with purplish-brown externally and speckled with red in the throat. A variety with the rose colour supplanted by white is occasionally met with. In this species as found in Sikkim the flowers measure only two and a half inches in expanse, the form with flowers four inches wide not yet having been observed in the Province. At the base of the Khasia Hills, and in many parts of Assam, the large and small-flowered forms grow together. They are structurally the same. The nearest ally of this is the Malayan *V. Hookeriana*, Benth. On the removal of the pollen apparatus from the anther, the pollinia fall forward because of the folding of the caudicle, and they ultimately rest on the gland.

PLATE 285.—*Vanda teres*, Lindl. Upper part of a plant, *of natural size*. Fig. 1 ovary, column and lip, *side view*, 2 column with anther *in situ* and foot, 3 apex of column with pollinia *in situ*, 4 pollinia after removal and after the bending of the caudicle, 5 empty anther, *from below; all enlarged*.

2. VANDA PARVIFLORA, Lindl. in Bot. Reg. XXX (1844), Misc. 45.

Stem stout, 4 to 12 in. long, clothed with the remains of sheaths of fallen leaves. *Leaves* linear-oblong, conduplicate, keeled, unequally and obtusely 2-lobed at the apex, the base not narrowed; length 3 or 4 in., breadth when flattened out ·4 to ·5 in. *Inflorescence* from below and about as long as the leaves; the peduncle as long as the raceme, bearing a few small scattered sheaths; *raceme* few-flowered. *Flowers* ·6 in. in diam. *Sepals* spathulate, obtuse, the lateral pair shorter than the dorsal. *Petals* spathulate-oblong, falcate, as long as the lateral sepals. *Column* thick, short, with a very short foot. *Lip* adnate to the foot of the column, spurred; the spur narrowly infundibuliform, half as long as the ovary, its mouth with erect oblong, rounded or sub-acute, side lobes; the apical lobe fleshy, decurved, oblong; the apex broad, erose, minutely emarginate or 2-lobulate; the upper surface caruncled and with a deep groove down the centre. *Anther* depressed, very slightly beaked in front; *pollinia* sub-globose, bifid. *Capsule* ·8 in. long, fusiform, with winged ridges. Wight Ic. 1669; Reichb. fil. in Gard. Chron. 1877, II, 166; Hook. fil. Fl. Br. Ind. VI, 50. *Ærides Wightianum*, Lindl. in Wall. Cat. 7320; Gen. and Spec. Orch., 238; in Journ. Linn. Soc. III, 40; Bot. Mag., t. 5138; Wight Ic. V, p. 8; Dalz. and Gibs. Fl. Bomb., 265.

Sikkim, at the base of the range and in the bottoms of hot valleys; in flower from April to June; Pantling, No. 270. Westward to Kumaon and Nepal; eastward and southward to Assam and Burma; also on the Western Ghâts of Southern India and in Ceylon.

The sepals and petals are pale buff, and the apical lobe of the lip is bluish-purple. There is, however, some variation as to colour, one form having sepals and petals brown, and another sepals and petals white; but neither of these has hitherto been found in Sikkim.

PLATE 286.—*Vanda parviflora*, Lindl. A plant, *of natural size*. Fig. 1 sepals and petals, *spread out*, 2 flower, 3 apex of ovary, column with anther *in situ*, and lip, *in profile*, 4 section of the foregoing, 5 lower surface of anther, 6 pollinia; *all enlarged*.

3. VANDA CRISTATA, Lindl. in Wall. Cat. 7328; Gen. and Spec. Orch. 216.

Stem 3 to 12 in. long, stout, covered with old sheaths. *Leaves* numerous, narrowly oblong, conduplicate, truncately and unequally bilobed at the apex, dilated towards the jointed widely sheathing base; length 3 to 4 in., breadth (when flattened out) ·6 or ·7 in. *Racemes* equal to or shorter than the leaves, axillary, 2- or 5-flowered. *Flowers* 1·5 to 2 in. across. *Sepals* sub-equal, spreading, oblong, obtuse. *Petals* oblong, narrower than the sepals. *Lip* longer than the sepals, adnate to the base of the column; the spur widely infundibuliform, half as long as the stalked ovary, its mouth with triangular erect side lobes; the apical lobe oblong, its apex with two divaricate oblong lobules, and under the apex a horn-like fleshy beak pointing downwards, the upper surface with five carunculate ridges. *Column* short, with no foot. *Anther* depressed, with a mesial ridge; *pollinia* ovoid, attached by a broad short caudicle to a quadrate gland. *Capsule* narrowly clavate, 2 to 2·5 in. long. Lindl. Sert. Orch. *frontisp.*, fig. 3; in Bot. Reg. 1842, t. 48; Fol. Orch. 10; Bot. Mag., t. 4304; Walp. Ann. VI, 869; Warner's Orch. Alb. VII, t. 290; Gartenflora, t. 680; Hook. fil. Fl. Br. Ind. VI, 53. *Ærides cristatum*, Wall. MSS. *Ærides* sp., Griff. It. Notes, 203, No. 1188.

Sikkim, at elevations from 2,000 to 6,000 feet, common; Pantling, No. 118. Westward to Kumaon, but not common. Bhutan, Sylhet.

The sepals, petals and ovary are of a pale olivaceous green or yellowish; the lip is also green, but boldly blotched with dull purplish-brown. The pollen-masses, after removal from the anther, fall forward owing to the bending of the caudicle, until they ultimately rest on the gland.

There are two forms of this in Sikkim; one found at elevations of 2,000 to 4,000 feet, with racemes producing as many as four or five flowers an inch in diameter; the other with flowers nearly twice as large as the former, but with only two of them on the raceme. The latter is most common at elevations of about 5,000 feet. In structure and coloration the flowers of the two are exactly alike. The second is the form figured here.

PLATE 287.—*Vanda cristata*, Lindl. A plant, *of natural size*. Fig. 1 bract, ovary, column with anther *in situ*, and lip in profile, 2 section of the upper part of the foregoing, 3 column with anther, *front view*, 4 apex of column, pollinia, and caudicle *in situ*, 5 lower surface of anther, 6 pollinia after removal, the caudicle having bent; *all enlarged*.

4. VANDA PUMILA, Hook. Fil. Fl. Br. Ind. VI, 53.

Stem and *leaves* as in *V. cristata* and *V. alpina*. *Racemes* much shorter than the leaves, 2-flowered. *Flowers* 1 in. across, drooping, *floral bract* minute. *Sepals* and *petals* sub-equal; the lateral sepals slightly broader, oblong, obtuse, curved, connivent. *Lip* shorter than the sepals, the base with a wide infundibuliform sac with small triangular oblong side lobes; apical lobe large, fleshy, broadly ovate, the apex sub-truncate, the upper surface

with two small knobs near the apex and four to six short thickened ridges in the centre. *Column* thick, short, with no foot. *Anther* depressed, slightly apiculate behind; *pollinia* broadly ovate, their apices divaricate; the caudicle quadrate; the gland large, broad, angled. *Capsule* clavate, ridged, 2·75 in. long. Hook. fil. Fl. Br. Ind. VI, 53. *Vanda cristata*, var. B., Lindl. Fol. Orch. 10.

Sikkim, in the bottoms of hot valleys; in flower during May; Pantling, No. 73.

The flowers are cream-coloured, the lip having long red markings, and the sepals and petals being slightly speckled with the same colour. They are very sweet-scented.

PLATE 288.—*Vanda pumila*, Hook. fil. A plant, *of natural size*. Fig. 1 bract, stalked ovary, column with anther *in situ*, and lip, 2 lip, 3 column with anther *in situ*, front view, 4 under surface of anther, 5 pollinia with the caudicle extended and the gland, 6 the same after removal, the caudicle having bent and brought the pollinia into contact with the gland; *all enlarged*.

5. VANDA ALPINA, Lindl. Fol. Orchid. 10.

Stem and *leaves* as in *V. cristata*. *Racemes* much shorter than the leaves, 2-flowered, or flowers solitary, nodding, ·75 in. long. *Sepals* and *petals* sub-equal, oblong, blunt, rather connivent than spreading, the petals somewhat smaller than the sepals. *Lip* adnate to the column, gibbous but not saccate or spurred at the base; side lobes shallow, rounded; apical lobe ovate, oblong, obscurely trilobulate towards the apex; the side lobules small, entire; the apical lobule retuse, its upper surface with shallow ridges. *Column* short, stout, with no foot. *Anther* flattened, *pollinia* ovoid, caudicle sub-quadrate, gland broadly and transversely oblong. *Capsule* narrowly clavate, ridged, 3 in. long. Hook. fil. Fl. Br. Ind. VI, 53. *V. Griffithii*, Lindl. in Paxt. Fl. Gard. II, 22; Fol. Orch. 10 (*excl. cit. Griff.*). *Luisia alpina*, Lindl. in Bot. Reg. 1838, Misc. 56.

Sikkim, at Tendong, elevation 5,000; in flower during July; Pantling, No. 164. Westward to Gharwal. Khasia Hills; Hooker and Thomson.

This has pretty nearly the colouring of *V. cristata*, Lindl., but the lip is different, there being no sac at its base, but only an expansion; the anterior lobe, moreover, has neither shallow smooth ridges nor is it carunculate like that of *V. cristata*. In habit and foliage it resembles *V. pumila* and *V. cristata*.

PLATE 289.—*Vanda alpina*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column with anther *in situ*, and lip, 3 section of the foregoing, 4 column with anther *in situ*, 5 under surface of anther, 6 pollinia and caudicle *in situ* on the apex of the column, 7 the same some time after removal; *all enlarged*.

51. Saccolabium, Blume.

Epiphytes without pseudo-bulbs. *Leaves* coriaceous, flat or conduplicate, often keeled. *Inflorescence* leaf-opposed or supra-axillary, racemose, sub-corymbose, umbellate or panicled; *floral bract* minute, much shorter than the stalked ovary. *Sepals* and *petals* adnate to the column, sub-equal, usually spreading, sometimes reflexed. *Lip* sessile on the footless column, consisting of a cylindric or saccate spur, without calli and non-septate, (with calli and horizontal septum in *S. trichromum*), with or without small lateral lobes; the apical lobe small, without a scale or callus under the short broad truncate column, often hairy.

Anther 1- or imperfectly 2-celled; *pollinia* two, entire or bipartite. Species about 55, natives of Eastern Asia.

Spur without septum or callus.

Spur of lip cylindric, straight or curved.

Spur long, more or less parallel to the ovary, straight.

Apical lobe of lip decurved, transversely rugulose; caudicle of pollinia slender, not dilated at the apex; flowers in panicles or umbels; stems very stout, elongate; leaves large, flat, keeled.

Flowers in umbels . . . . . 1. *S. papillosum.*

Flowers in panicles.

Panicles longer than the leaves, many-branched . . 2. *S. ochraceum.*

Panicles shorter than the leaves, few-branched . . 3. *S. longifolium.*

Spur long, slender, curved, not parallel to the ovary; flowers in racemes.

Spur curved backwards; apical lobe of lip narrow, tongue-like, side lobes none; caudicle of pollinia slender, not dilated at the apex; stem 3 to 5 in. long, stout; leaves rigid, keeled . 4. *S. ampullaceum.*

Spur curved forwards; apical lobe of lip broadly triangular, acute, much decurved; side lobes small, rounded; caudicle of pollinia dilated towards the apex; leaves flat, stem under ·5 in. long . . . . . 5. *S. Pumilio.*

Spur of lip infundibuliform.

Spur long, curved forwards; apical lobe small, often fleshy, glabrous; caudicle of pollinia broadly cordate or 2-lobed at the apex, the pollinia attached by a hooked process; flowers in racemes; leaves flat, keeled, stems elongate.

Racemes longer than the leaves . . . . . 6. *S. obtusifolium.*

Racemes shorter than the leaves.

Side lobes of lip rounded, erose; leaves not exceeding 3 in. in length . . . . . 7. *S. acuminatum.*

Side lobes of lip none; leaves narrow, 3 to 5 in. long . 8. *S. lancifolium.*

Spur short with a very wide mouth and a bulbous bifid apex; the pollinia sessile on the dilated apex of the caudicle; apical lobe of lip narrowly oblong; flowers in panicles, stem elongate, leaves flat . . . . . 9. *S. buccosum.*

Spur of lip short, wide, saccate, at right angles to the ovary.

Apical lobe of lip semi-circular or reniform, fimbriate or papillose; caudicle of pollinia filiform; flowers in corymbose racemes or umbels; leaves flat, not setulose.

Stemless; upper surface of lip quite smooth, its edges deeply laciniate . . . . . 10. *S. dasypogon.*

Stem short; upper surface of the apical lobe of the lip papillose-hairy . . . . . 11. *S. calceolare.*

Stem elongate.

Apical lobe of lip semi-circular, not lobulate, densely fringed with white fimbreæ, spur with three faint external ridges . . . . . 12. *S. intermedium.*

Apical lobe reniform, 3-lobulate, the edges fimbriate-erose, the upper surface glabrous except a broad papillose-pubescent border; spur with one internal ridge . . . 13. *S. aculifolium.*

Apical lobe of lip small, semi-circular or broadly oblong, entire, glabrous, without calli or with small calli or ridges; caudicle of pollinia slender; flowers in short racemes, stems very slender, leaves flat with setulose apices.

Apical lobe of lip triangular.

Apical lobe with two small conical calli near its base . *14. S. distichum.*

Apical lobe with two mesial ridges . . . . . *15. S. affine.*

Apical lobe of lip broadly cordate, blunt, without calli or ridges . . . . . *16. S. pseudo-distichum.*

Spur with two calli about the middle and a small horizontal plate or septum near the mouth . . . . . *17. S. trichromum.*

1. Saccolabium papillosum, Lindl. in Bot. Reg. t. 1552 (*excl. syn.*).

Stems erect, rigid, clustered, ·35 in. thick, bearing many sub-horizontal leaves, sometimes branched. *Leaves* coriaceous, curved, conduplicate, the apex truncate or obliquely notched; length 3 to 4 in., breadth (when flattened out) ·6 to ·8 in. Peduncle leaf-opposed, about ·5 in. long, bearing a sub-corymbose 4- to 8-flowered raceme. *Flowers* ·35 in. across; *floral bract* triangular. *Sepals* sub-equal, oblong, sub-acute, spreading. *Petals* narrower than the sepals, sub-spathulate. *Lip* slightly longer than the sepals, adnate to the base of the column, its base with a cylindric, slightly tapering spur half as long as the ovary and sub-parallel to it, hairy within; side lobes none; apical lobe decurved, ovate-oblong, blunt, crenate, the upper surface transversely rugulose. *Column* short. *Anther* broadly conical; *pollinia* two, deeply bipartite, sub-ovoid; caudicle elongate, tapering downwards to the small oblong-quadrate gland. *Capsule* fusiform, ridged, 1·25 in. long. Lindl. Gen. and Spec. Orch. 222; Hook. fil. Fl. Br. Ind. VI, 63. *S. carinatum*, Griff. Notul. III, 354. *Acampe papillosa*, Lindl. Fol. Orch. 2; Walp. Ann. VI, 873.

Sikkim, at low elevations; in flower from October to January; Pantling, No. 243. Khasia, Assam, Chittagong, the Bengal Sunderbans, and Burma.

In Sikkim the sepals and petals of this are yellow with brown bars, the spur of the lip is pale yellow, and the apical lobe is white with transverse pale purple markings.

Plate 290.—*Saccolabium papillosum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ* and lip, *in profile*, 3 section of preceding, 4 under surface of empty anther, 5 pollinia; *all enlarged*.

2. Saccolabium ochraceum, Lindl. in Bot. Reg. 1842, Misc. 2.

Stem stout, 1 to 3 feet long, bearing numerous sub-horizontal leaves. *Leaves* fleshy, rigid, keeled, oblong; the apex blunt and unequally bifid, the base not contracted at the junction with the sheath; length 6 to 9 in., breadth 1 to 1·3 in. *Panicles* leaf-opposed, nearly erect, slender, rigid, twice as long as the leaves; the branches numerous, 2- to 6-flowered *Flowers* ·4 in. across; *floral bract* minute, broadly triangular; ovary sessile, sparsely pubescent. *Sepals* unequal, the dorsal broadly oblanceolate, blunt; the lateral pair smaller, oblong, sub-falcate, blunt. *Petals* as long as the sepals, spathulate. *Lip* shorter than the sepals and petals, the base with a long cylindric spur nearly as long as the ovary and parallel with it, hairy within; the side lobes, near the base

of the apical lobe, small, sub-triangular, erect, toothed below; apical lobe deflexed, fleshy, broadly oblong, blunt, the upper surface carunculate and the margins slightly wavy. *Column* short, thick, with a stout tooth on each side of the anther. *Anther* dome-shaped, with a short, broad, recurved beak; *pollinia* two, unequally bipartite, broadly ovoid, cohering to the long narrow caudicle; gland small, oblong. *Capsule* fusiform, 1 to 1·5 in. long. Hook. fil. Fl. Br. Ind. VI, 62. *S. lineolatum*, Thwaites' Enum. Pl. Ceyl. 304. *Acampe dentata*, Lindl. Fol. Orch. 3; Reichb. fil. in Gard. Chron. for 1872, p. 1752; in Walp. Ann. VI, 894. *A. Wightiana*, var. *longe-pedunculata*, Thwaites' Enum. Pl. Cey. 303.

Sikkim, along the base of the range and in the bottoms of low valleys; in flower during November and December; Hooker, Pantling No. 133. Bhotan, Khasia and Tenasserim; also in Malabar and Ceylon.

The sepals and petals are yellow with irregular brown markings. The spur of the lip is also yellow but without brown spots, and the apical lobe is white speckled with purple.

PLATE 291.—*Saccolabium ochraceum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column with anther and lip, *seen from the side*, 3 section of the foregoing, 4 apex of the column, showing its teeth and the pollinia *in situ*, the cap of the anther having been removed, 5 pollinia after removal, 6 anther, upper surface; *all enlarged*.

3. SACCOLABIUM LONGIFOLIUM, Hook. fil. Fl. Br. Ind. VI, 62.

Stem very stout, 24 to 36 in. long. *Leaves* coriaceous, oblong; the apex broad, emarginate or sub-bifid; the base jointed to the short wide sheath, not tapered; length 10 to 14 in., breadth 1·5 to 2 in. *Inflorescence* leaf-opposed, stout, rigid, erect, much shorter than the leaves, bearing a few distant sheaths in its lower part, and a terminal sub-corymbose few-flowered raceme, often with one or two lateral, short, sub-corymbose branches smaller than the terminal one. *Flowers* fleshy, ·5 in. across; *floral bract* ovate, much shorter than the ovary. *Sepals* elliptic-oblong, sub-acute. *Petals* smaller than the sepals. *Lip* with a short conical spur, narrow acute-angled side lobes, and a fleshy ovate apical lobe transversely wrinkled on the upper surface. Apex of *anther* with two conical points; *pollinia* ellipsoidal. *Acampe ? longifolia*, Lindl. Fol. Orch., Acampe, 1. *? A. multiflora*, Lindl. l.c. *Vanda longifolia*, Lindl. in Wall. Cat. 7322; Gen. and Spec. Orch. 215; in Journ. Hort. Soc. VII, 267; Reichb. fil. in Walp. Ann. VI, 872. *V. multiflora*, Lindl. Collect., t. 38.

Sikkim, in tropical valleys and along the foot of the range; in flower during June; Pantling, No. 250. Upper Assam; Mann. Burma; Wallich. Distrib. ? China.

PLATE 292.—*Saccolabium longifolium*, Hook. fil. Part of a plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column, lip with anther *in situ*, 3 section of the foregoing, 4 lip, 5 column, 6 and 7 pollinia, before and after removal from the anther; *all enlarged*.

4. SACCOLABIUM AMPULLACEUM, Lindl. in Wall. Cat. 7307; Sert. Orch., t. 17.

Stems stout, clustered, 3 to 5 in. long, clothed at the base with the sheaths of fallen leaves. *Leaves* thickly coriaceous, narrowly oblong, keeled, acutely bifid, sometimes toothed between the lobes, the base jointed to the sheath and not narrowed. *Racemes* from the axils of the leaves, erect, shorter than the leaves, many-flowered; the peduncle

short, stout and sheathed at the base, the flowering rachis slender. *Flowers* ·65 in. in diam. vertically; *floral bract* very minute, the stalked ovary about ·4 in. long. *Sepals* and *petals* sub-equal, spreading, obovate, blunt. *Lip* with a spur longer than the sepals, flexuose, cylindric, blunt, sometimes inflated at the bend; side lobes none; apical lobe linear-oblong, sub-acute, entire, its tip upturned. *Column* short, stout. *Anther* dome-shaped, shortly beaked in front; *pollinia* two, globose, divaricate; caudicle strap-shaped, its margins in-folding after removal from the column; gland oblong-quadrate. *Capsule* sub-clavate, 1 in. long. Lindl. in Journ. Linn. Soc. III, 35 (*excl. syn.*); Paxt. Mag. Bot. XIII, t. 49; Bot. Mag., t. 5595; Hook. fil. Fl. Br. Ind. VI, 64. *Ærides ampullaceum*, Roxb. Fl. Ind. III, 476.

Sikkim, common at elevations of 1,000 to 3,000 feet; Pantling, No. 259. Westward to Nepal; eastward and southward to Sylhet, Munipur, Burma, Khasia Hills; in flower during March and April.

All the parts of the flower except the pollinia are coloured pink of various shades, and the leaves are invariably mottled with brown; the pollinia are deep purple. In Sikkim all specimens have the spur of the lip flexuose, not straight. This is very closely allied to *S. curvifolium*, Lindl., which has, however, orange-scarlet flowers and longer narrower leaves. A plant of this collected in Assam by Dr. G. Watt, C.I.E., had brick-red flowers, but their structure in no way differed from those of the plant here figured.

PLATE 293.—*Saccolabium ampullaceum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ* and lip, *seen from the side*, 3 section of the foregoing, 4 under surface of empty anther, 5 pollinia as they rest on the column prior to removal, 6 the same after removal; *all enlarged*.

5. SACCOLABIUM PUMILIO, Reichb. fil. in Walp. Ann. VI, 886; Gard. Chron. 1875, II, 98.

Stem very short, pendulous. *Leaves* two or three, linear-oblanceolate, slightly falcate, the acute apex minutely and obliquely bifid; length 1·5 to 3·5 in., breadth ·4 to ·6 in. *Inflorescence* about as long as the leaves; the peduncle slender, shorter than the many-flowered *raceme*, with a tubular sheath about the middle; rachis of *raceme* stout. *Flowers* ·2 in. long; *floral bract* minute, ovate, acute. *Sepals* unequal; the dorsal oblanceolate-oblong, obtuse, concave, overhanging the column; the lateral pair spreading, elliptic, obtuse. *Petals* linear-oblanceolate, obtuse, toothed at one side, smaller than the sepals. Base of *lip* with a long tapering spur exceeding the ovary and curving forwards; the side lobes at the mouth of the spur small, short, rounded; the apical lobe broadly triangular, acute, much decurved. *Column* stout, not winged. *Anther* much depressed, shortly beaked. *Pollinia* obovoid, attached by a stout tapering caudicle to a small narrow gland. *Capsule* cylindric, tapering at the base, ribbed, ·8 in. long. Hook. fil. Fl. Br. Ind. VI, 56. *S. discolor*, Reichb. fil. Ot. Hamb., 42. *S. pusillum*, Lindl. in Journ. Linn. Soc. III, 36 (*not of Blume*). *Œceoclades pusilla*, Lindl. in Wall. Cat. 7332; Gen. and Spec. Orch., 237.

Sikkim, at elevations of about 1,500 feet; in flower during April; Pantling, No. 112. Sylhet; Wallich.

The flowers are cream-coloured with a dash of purple at the entrance of the spur and at the base of the apical lobe of the lip, the column being brownish pink. On

the removal of the pollinia from the anther, the caudicle (previously somewhat bent) immediately falls forward to the same plane as the gland, while the pollinia move in a reverse direction until they assume a position at right angles to the caudicle.

PLATE 294.—*Saccolabium Pumilio*, Reichb. fil. Two plants. Fig. 8, fruit; *of natural size*. Fig. 1 a flower, 2 profile view of bract, sub-sessile ovary, column with anther *in situ*, and lip, 3 section of ovary and lip, 4 apex of ovary and column with anther *in situ*, 5 lower surface of anther, 6 apex of column with pollinia *in situ*, the cap of the anther having been removed, 7 pollinia after completion of the movement which follows removal, 9 section of fruit; *all enlarged*.

6. SACCOLABIUM OBTUSIFOLIUM, Hook. fil. Ic. Plant., t. 2134.

Stem pendulous, ·35 in. thick and 4 to 6 in. long. *Leaves* oblong, flat, somewhat tapered to the bluntly bilobed apex and slightly contracted to the jointed base; length 6 to 8 in., breadth 1 to 1·25 in. *Inflorescence* from below the leaves or leaf-opposed, longer than the leaves; the peduncle stout, with three or four short broad blunt sheaths; the *raceme* about as long as the peduncle, densely many-flowered. *Flowers* ·5 in. across; *floral bract* oblong, blunt, more than half as long as the shortly-stalked ovary. *Sepals* obovate, blunt, sub-connivent, the dorsal concave. *Petals* broader than the sepals and somewhat shorter, blunt. *Lip* longer than the sepals, consisting mainly of a large very wide-mouthed infundibuliform sac much curved forward and bulbous at the apex; the side lobes on the edge of the mouth of the spur near the column, small, triangular; apical lobe thickened, laterally compressed, pouched and 3-lobulate; the two posterior lobules oblong, blunt, directed backwards; the middle one broadly triangular, acute and directed upwards. *Column* short, rostellum beaked. *Anther* tumid, with a long beak. *Pollinia* two, small, obliquely ovoid, attached by a curved process to the apex of the large caudicle; caudicle broadly cordate or 2-winged at the apex, narrowed below to the oblong-lanceolate gland. *Capsule* fusiform, ·65 in. long. Hook. fil. Fl. Br. Ind. VI, 65. *Uncifera obtusifolia*, Lindl. in Journ. Linn. Soc. III, 40.

Sikkim, at elevations of 3,500 to 5,000 feet; in flower during September and October; Pantling, No. 234. Bhutan; Lister. Khasia Hills; Hooker and Thomson, Mann.

The flowers are of a pale yellow tint, the apical lobe of the lip and the apices of the petals and sepals being of a brighter tone. The attachment of the pollinia to the caudicle and the shape of the latter are peculiar, and induced Lindley to form for the reception of all the species with the same arrangement the genus *Uncifera*. The pollinia lie inverted and are attached to the end of a small curved process which proceeds from the apex of the caudicle. The caudicle is an elongated body broadly cordate or two-winged at the apex, and tapering to the point by which it is inserted on the large elongate gland. On removing the whole apparatus from the anther the wings of the caudicle close, but the pollinia retain their inverted position.

PLATE 295.—*Saccolabium obtusifolium*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column with anther *in situ*, and lip, *side view*, 3 apex of ovary and the column, showing the inverted pollinia (*p*), the large caudicle (*c*) and the elongate gland (*g*), 4 empty anther *from the side*, 5 pollinia, caudicle and gland *as seen from the front*, 6 the tip of the caudicle and the pollinia; *all enlarged*.

7. Saccolabium acuminatum, Hook. fil. Ic. Plant, t. 2135.

Stem slender, pendulous, 6 to 9 in. long, clothed below with the narrow tubular sheaths of fallen leaves. *Leaves* linear-oblong, slightly narrowed to the sheathing base; the apex acuminate, not bifid; length 1·35 to 3 in., breadth ·3 to ·5 in. *Racemes* leaf-opposed, rather shorter than the leaves, 8- to 12-flowered. *Flowers* ·25 in across, crowded; *floral bract* ovate, acute. *Sepals* ovate-rotund, the dorsal concave. *Petals* broader, oblique, sub-truncate. *Lip* consisting chiefly of an infundibuliform spur longer than the ovary and boldly curved forwards; side lobes rather large, rounded, erose; apical lobe very fleshy, broadly triangular. *Column* short, thick; the rostellum large, projecting; *pollinia* globose, attached to a thick hooked process proceeding from the apex of the caudicle; caudicle with two broad shoulders at its apex, gradually tapering to the narrow pointed gland. Hook. fil. Fl. Br. Ind., VI, 65. *Uncifera acuminata*, Lindl. in Journ. Linn. Soc. III, 40.

Sikkim, at elevations of 6,000 or 7,000 feet; in flower from July to September. Gamble No. 10453; Pantling, No. 290. Khasia Hills; Griffith (Kew Distribution No. 5257), Clarke No. 14,286, G. Mann; at 4,000 feet, G. Gammie.

The flowers are of a pale green, almost white on the anterior lobe of the lip and on the tips of the petals. On removing the pollinia from the anther, the caudicle falls forward suddenly to the same plane as the gland, and the curved process at its apex to which the pollinia are attached, is then seen to consist of a folded membrane which opens along the upper margin and slightly separates the two masses. This species is rare in Sikkim, only a single specimen having as yet been collected. It is, however, common in the Khasia Hills. This is allied to *S. obtusifolium*, but is a more slender plant with shorter, narrower, entire, acuminate leaves and smaller paler flowers.

Plate 296.—*Saccolabium acuminatum*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, 2 profile of bract, ovary, column with anther *in situ*, and lip, 3 vertical section of column and lip, 4 apex of column with the anther *in situ*, the cap of the anther not having been removed; *the small stigma* (*s*) *is seen beneath the* rostellum, 6 apex of column with the pollinia, caudicle and gland *in situ*, the cap of the anther having been removed, 5 anther from the side, 7 pollinia, *after removal; all enlarged.*

8. Saccolabium lancifolium, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 122.

Stem slender, pendulous, 8 to 12 in. long. *Leaves* fleshy, linear, acuminate, aristate at the apex, slightly keeled, 3 to 5 in. long and ·25 to ·3 in. broad. *Racemes* axillary, densely-flowered, 1·5 to 2 in. long, their peduncles as long as themselves and bearing a few membranous lanceolate scattered bracts. *Flowers* ·3 in. across; *floral bracts* minute, triangular, much shorter than the short ovary. Dorsal *sepal* broadly ovate, very concave, its apex broad and slightly emarginate; the lateral pair obliquely obovate, blunt, all three connivent. *Petals* oblong, blunt. *Lip* boat-shaped, its limb about as long as the sepals, the apex very fleshy, blunt. *Spur* funnel-shaped, longer than the ovary, much curved forwards, its apex not thickened. *Column* very short, the rostellum beaked. *Pollinia* two, globular-ovoid, attached to the inflexed beak of the caudicle; caudicle broad below the beak, much narrowed to the base; gland elongate, notched at its base.

Sikkim, at Rissisoom, elevation 6,000 feet; flowering in June; Pantling, No. 152.

Allied to *S. acuminatum*, Hook. fil., but with longer, narrower, and more sparsely arranged leaves. The lip is also different, there being no trace of side lobes; the caudicle differs also.

PLATE 297.—*Saccolabium lancifolium*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 profile of bract, ovary, column, anther and lip, 3 longitudinal section of column and lip, 4 petals, 5 half front view of column, the stigma (*s*), 6 apex of column with pollinia *in situ*, the cap of the anther having been removed, 7 pollinia, &c., after removal, 8 empty anther, *side view; all enlarged*.

9. SACCOLABIUM BUCCOSUM, Reichb. fil. in Gard. Chron. 1871, 938.

Stem pendulous, 6 to 12 in. long, slender, covered with the sheaths of fallen leaves. *Leaves* narrowly oblong; the apex blunt and divided into two broad unequal slightly oblique lobules; the base slightly narrowed and jointed to the sheath; length 2·75 to 3·5 in., breadth ·6 to ·75 in. *Panicle* leaf-opposed, longer than the leaves; the peduncle shorter than the leaves, bearing one or two sub-tubular acute sheaths; the branches only one or two, racemose. *Flowers* lax, ·35 in. across; the stalked ovary ·3 or ·4 in. long, slender; the *floral bract* subulate and much shorter. *Sepals* sub-equal, broadly ovate or sub-obovate, longer than the spur. *Petals* much smaller than the sepals, cuneately obovate. *Lip* longer than the sepals, the base with a bottle-shaped spur with a narrow mouth and contracted neck, the apex globose and didymous; side lobes spreading, rounded or angled; the apical lobe narrowly oblong. *Column* long, with broad truncate wings, its apex rounded and recurved. Lip of *anther* with a long point; *pollinia* globose; the caudicle very slender, arched; the gland linear, minute. Hook. fil. Fl. Br. Ind. VI, 58. *S. parvulum*, Lindl. in Journ. Linn. Soc. III, 36 (*in note*). *Œceoclades paniculata*, Lindl. in Wall. Cat. 7334; Gen. and Spec. Orch. 236. *Cymbidium Satyrium*, Herb. Ham.

Sikkim, at elevations of about 2,000 feet; in flower during May and June; Pantling, No. 158. Bhotan; Lister. Assam; Hamilton. Sylhet; Wallich. Tenasserim; Parish.

PLATE 298.—*Saccolabium buccosum*, Reichb. fil. A plant, *of natural size*. Fig. 1 a flower, 2 side view of bract, ovary, column and lip, 3 vertical section of the preceding, 4 the column showing the rostellum (*r*) and the entrance to the stigmatic cavity (*s*), 5 empty anther, 6 pollinia, 7 a single pollen mass; *all enlarged*.

10. SACCOLABIUM DASYPOGON, Lindl. Gen. and Spec. Orch., 222.

Stem very short, pendulous. *Leaves* oblong; the apex acute, minutely and unequally notched, slightly tapered to the shortly sheathed base; length 4 to 9 in., breadth 1 to 1·65 in. *Raceme* corymbose, much shorter than the leaves; its peduncle stout, with a broad tubular sheath near the base. *Flowers* crowded, ·85 in across; *floral bract* broad, blunt. *Sepals* and *petals* sub-equal, spreading, oblong-oblanceolate, blunt. *Lip* about as long as the sepals and petals, adnate to the greater part of the column, widely saccate, compressed below; side lobes shallow; apical lobe thick, semi-circular, produced at the ends, its edges laciniate, the disc quite glabrous. *Column* very short. *Anther* depressed, with a short broad beak in front; *pollinia* globular, umbilicate in front; the caudicle long, slender, expanded at the apex between the pollinia; gland oblong, cordate. *Capsule* cylindric, tapering at the ends, ridged, 1·25 in. long. Hook.

fil. Fl. Br. Ind. VI, 66. *Ærides dasypogon*, Smith in Rees' Cyclop., Suppl. *Epidendrum umbellatum*, Ham. MSS.

Sikkim, at elevations of about 1,000 feet; in valleys and along the southern face of the range; in flower during November and December; Pantling, No. 248. Westward to Nepal. Assam, at Goalpara; G. Mann. Jaintia Hills, at Jowai; King's Collector.

The sepals and petals are bright yellow with brownish-purple spots; the lip is white except a patch of yellow with minute brown spots near the apex and a purple line round the edges of the sac; the column is pink. This is closely allied to *S. calceolare*, Lindl., with which for many years it has been confused. The two plants, although much alike, are not really difficult of separation. In the first place they live at different elevations and flower at different seasons. *S. calceolare* is found between 4,000 and 6,000 feet, and flowers during March and April; while *S. dasypogon* is found at or below 1,000 feet and is in flower during November and December. The leaves of *S. dasypogon* are broader, and the apical notch is less deep than is the case in the leaves of *S. calceolare*, and the stem of *S. dasypogon* is shorter. The coloration of the flower of *S. calceolare* is constant; but in that of *C. dasypogon* the perianth may be pale or deep yellow, and either without spots or with numerous spots. Finally the lips of the two differ. In *S. calceolare* the sac is smaller; the apical lobe is papillose-hairy; while in *S. dasypogon* the apical lobe has deeply laciniate edges and its upper surface is perfectly smooth.

PLATE 299.—*Saccolabium dasypogon*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 profile of column, anther and lip, 3 transverse section of the saccate portion of the lip, 4 section of apex of ovary, column and lip, 5 anther, upper surface, 6 pollinia, front and back views; *all enlarged*.

11. SACCOLABIUM CALCEOLARE, Lindl. in Wall. Cat. 7302; Gen. and Spec. Orch., 223.

Stem short, pendulous. *Leaves* narrowly oblong, the apex unequally bifid, the base slightly narrowed and jointed to the short wide sheath; length 4 to 11 in., breadth ·75 to 1·15 in. *Racemes* corymbose, many-flowered, much shorter than the leaves, the peduncle with several short sheaths. *Flowers* ·65 in. across, crowded; *floral bract* broad, blunt. *Sepals* unequal, spreading, the dorsal obovate-oblong; the lateral pair oblong, falcate, narrower than the dorsal. *Petals* oblong-obovate, shorter than the sepals. *Lip* adnate to the lower half of the column; the base forming a wide short sac, nearly parallel with and about half as long as the ovary; side lobes absent; the apical lobe at right angles to the sac, semi-circular, its margin and the whole of its upper surface, except a triangular yellow pad at the base, covered with white hair-like papillæ. *Column* very short, thick. *Anther* depressed, very shortly beaked; *pollinia* broadly ovoid-elliptic, attached by a slender caudicle to a small triangular-cordate gland. Lindl. Sert. Orch., *Frontisp.* 6; in Bot. Reg. 1838, Misc. 139; in Journ. Linn. Soc. III, 33 (*excl. synonym*); Griff. Notul. III, 356; Itin. Notes, 170, No. 869; Ic. Pl. Asiat., t. 334; Walp. Ann. VI, 883; Hook. fil. Fl. Br. Ind. VI, 60. *Ærides calceolare*, Smith in Rees' Cyclop., Suppl. *Æ. leopardorum*, Wall. MSS. *Gastrochilus calceolaris*, Don Prodr. 32. *Sarcochilus nepalensis*, Spr. Syst. Veg. III, 721. *Epidendrum calceolare*, Ham. MSS.

Sikkim, at elevations from 4,000 to 6,000 feet; in flower during March and April; Pantling, No. 68. Westward along the range, at similar elevations, to Gharwal. In the Khasia Hills; Griffith (Kew Distrib. No. 5207), G. Gammie.

The sepals and petals are pale green with large roundish brown markings; the sac of the lip is bright yellow with brownish-red markings, and the apical lobe, except the smooth yellow speckled pad at its base, is pure white; the column is reddish. This species is allied to *S. dasypogon*, as is stated under that species.

PLATE 300.—*Saccolabium calceolare*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 side view of bract, stalked ovary, column, anther and lip, 3 section of apex of ovary, column and lip, 4 transverse section of sac of lip, 5 apex of column with the pollinia *in situ*, the cap of the anther having been removed, 6 pollinia removed from anther; *all enlarged*.

12. SACCOLABIUM INTERMEDIUM, Griff. MSS. ex Lindl. in Journ. Linn. Soc. III, 33.

Stem slender, pendulous, 8 to 24 in. long, clothed with old leaf-sheaths. *Leaves* linear, acuminate, entire, the base not narrowed at its junction with the sheath; length 3 to 8 in., breadth ·3 to ·4 in. *Umbels* scarcely longer than the sheaths of the leaves, 3- or 4-flowered; the peduncle less than ·5 in. long. *Flowers* ·5 in. across; *bract* ovate, acute, minute. *Sepals* spreading, oblanceolate-oblong, blunt, the lateral pair narrower than the dorsal. *Petals* oblong, slightly oblanceolate, blunt, smaller than the sepals. *Lip* fleshy, as long as the sepals, adnate to the lower part of the column, the base forming a deep blunt sac with three faint ridges externally; side lobes obscure; apical lobe semi-circular from a broad base, blunt, minutely papillose, its edges with a thick fringe of coarse white fimbriæ. *Column* short, stout. *Anther* dome-shaped, shortly beaked in front, minutely papillose; *pollinia* broadly ovate, somewhat oblique; caudicle filiform, gland oblong, bifid. Hook. fil. Fl. Br. Ind. VI, 61. *S. calceolare*, Paxt. (not of Lindl.) Mag. Bot. VI, 97. *Saccolabium*, Griff. Notul. III, 357; Ic. Pl. Asiat., t. 333.

Sikkim, at Gopal-dara, on the Nepal frontier, elevation 3,000 feet; in flower during August; a rare plant; Pantling, No. 356. Khasia Hills; alt. 3,000 to 5,000 feet; Griffith, Gibson, Hooker and Thomson.

The flowers of this are yellow, boldly spotted with brownish-purple, the fimbriæ at the apex of the lip alone being white. The column is pinkish. This species is allied to *S. calceolare*, *S. dasypogon*, and *S. acutifolium*, but differs from all in having a very long slender stem with elongated linear leaves and short umbels bearing only three or four flowers.

PLATE 301.—*Saccolabium intermedium*, Griff. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther *in situ*, and lip, *in profile*, 3 vertical section of apex of ovary, column and lip, 4 part of the lip, 5 transverse section of sac of lip, showing the three small external ridges, 6 anther seen from above, 7 apex of column with pollinia *in situ*, the cap of the anther having been removed, 8 pollinia removed and seen from the side; *all enlarged*.

13. SACCOLABIUM ACUTIFOLIUM, Lindl. Gen. and Spec. Orch., 223.

Stem 8 to 14 in. long, clothed with the short erose sheaths of fallen leaves. *Leaves* fleshy, oblong-lanceolate, acute, slightly and obliquely bifid, the base sub-amplexicaul, jointed to the short tubular sheath; length 4 to 6 in., breadth ·85 to 1·25 in. *Racemes*

leaf-opposed; the peduncle about 1·75 in. long, with two tubular sheaths. *Flowers* six to eight in an umbellate *raceme*, ·85 in. wide (measured across the lateral sepals); *floral bract* broadly oblong, blunt. *Sepals* and *petals* fleshy, sub-equal, slightly reflexed, oblong-oblanceolate, blunt. *Lip* shorter than the petals, adnate to the column almost to its apex, the base forming a wide but rather shallow sac with a rudimentary septum inside it; side lobes very narrow, entire or almost obsolete; apical lobe reniform, obscurely 3-lobulate, the edges fimbriate-erose; the upper surface with a large, broadly ovate, fleshy, glabrous patch near the base and with a broad thin margin, papillose-pubescent on the surface. *Column* short, thick. *Anther* dome-shaped, beaked in front; *pollinia* globular; caudicle filiform, dilated at base and apex; gland elongate, bifid. Lindl. Sert. Orch., *Frontisp.* 2; in Journ. Linn. Soc. III, 33; Walp. Ann. VI, 883; Hook. fil. Fl. Br. Ind. VI, 61. *S. denticulatum*, Paxt. Mag. Bot. VII, t. 145; Bot. Mag., t. 4772. *Ærides umbellatum*, Wall. MSS.

Sikkim, at elevations of about 3,000 feet; in flower during November and December; Pantling, No. 3. Khasia Hills.

The sepals and petals are either of a dull pale green, flushed and mottled with dull brown, or they are of a uniform yellow colour. The lip is white, the fleshy disc on its upper surface being bright yellow spotted with dull red, and the fundus of the sac externally being greenish-yellow. The column is purple.

This species is allied both to *S. calceolare* and to *S. dasypogon*, but not so much to either as those are to each other. It grows at elevations intermediate between them. This, unlike the other two, has an elongated stem and an inflorescence bearing not more than eight flowers which form an umbel rather than a corymb. The sac of the lip is also more shallow than in those, and the coloration of the sepals and petals is different. The apical lobe of the lip is in this distinctly trilobulate, while in those it has no trace of lobulation. There are further differences in the apical lobe of the lips of the three species, which may be shortly summarized thus; that of *S. dasypogon* is glabrous with laciniate but not lobulate edges; that of *S. acutifolium* has trilobulate, fimbriate-erose edges, and its upper surface has a large thickened smooth spot with a broad thin margin covered with papillose hairs; while that of *C. calceolare* is not lobulate, and its upper surface is papillose-hairy, except a small glabrous patch.

PLATE 302.—*Saccolabium acutifolium*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 apex of ovary, column with anther *in situ*, and lip, *in profile*, 3 longitudinal section of the preceding, 4 transverse section of sac to show the internal ridge, 5 anther, *from above*, 6 pollinia, *front and side views; all enlarged*.

14. SACCOLABIUM DISTICHUM, Lindl. in Journ. Linn. Soc. III, 64.

Stems very slender, pendulous, branching, many-leaved, 6 to 10 in. long. *Leaves* fleshy, lanceolate, the apex acuminate and bearing two, rarely three, fine setae; the base sessile and slightly oblique; length ·75 to 1 in., breadth near the base ·2 to ·25 in. Peduncles leaf-opposed, about equal to the leaves in length, bearing two to four flowers in a lax *raceme*. *Flowers* ·45 in. across; *floral bract* oblong, sub-acute. *Sepals* and *petals* sub-equal, oblong-elliptic, obtuse. *Lip* about as long as the sepals, adnate to the lower half of the column, the base with a wide blunt sac at right angles to the ovary, its inner

surface free from hairs or calli, side lobes absent; apical lobe fleshy, semi-circular, entire, smooth, its margins deflexed, with two blunt conical calli at its base. *Column* broad; the rostellum short, broad. *Anther* sub-quadrate, with a short beak in front; *pollinia* two, elliptic, with a lateral shoulder; caudicle long, slender, cylindric; gland elongate, bifid. *Capsule* fusiform, ·65 in. long. Reichb. fil. in Ot. Hamb., 43; Hook. fil. Fl. Br. Ind. VI, 64; in Ann. Bot. Gard. Calc. V, 49, t. 73 (*in part*).

Sikkim, common at elevations of 6,000 to 8,000 feet; in flower during March, April and May; Gamble No. 8075; Kurz; Griffith (Kew Distrib. No. 5211); Pantling No. 132. Manipur; Watt No. 6338.

The flowers of this are green of various shades, marked with irregular brown spots, the apical lobe of the lip being pale yellow. This grows along with *S. pseudo-distichum*, but flowers at a different season. The two have hitherto been confused under the name of this. The leaves are sometimes speckled with brown.

PLATE 303.—*Saccolabium distichum*, Lindl. A plant, *of natural size*. Fig. 1 flower, 2 bract, ovary, column with anther *in situ*, and lip *in profile*, 3 section of column and lip, 4 column and anther, *front view*, 5 apex of ovary with pollinia *in situ*, the cap of the anther having been removed, 6 pollinia; *all enlarged*.

15. SACCOLABIUM AFFINE, *new species*.

Stem and *leaves* as in *S. distichum*, Lindl. and *S. pseudo-distichum*, King and Pantling. Peduncle slender, ·75 in. long, bearing two or three flowers in a short *raceme*. *Flowers* ·3 in. across. *Floral bract* ovate, acute, much shorter than the stalked ovary. *Sepals* and *petals* sub-equal, ovate-elliptic, obtuse, spreading, except the concave incurved dorsal sepal. *Lip* as long as the sepals, adnate to the base of the column, the base with a wide dorsally compressed sub-acute conical sac almost at right angles to the ovary, smooth on the inner surface, without calli, bifid at the apex; side lobes very narrow; apical lobe decurved, broadly triangular, sub-acute, its margins erose near the base, its upper surface with two thick mesial ridges from base to apex. *Column* and *pollinia* as in *S. distichum*.

Sikkim, above Pemiongtsi, elevation 8,000 feet; in flower during June; Pantling No. 444.

The colour of the sepals and petals is green flushed with brown; that of the lip is yellowish.

This comes very near *S. distichum* and *S. pseudo-distichum*, and ought possibly to be treated as a variety rather than as a species. From both the plants just mentioned it differs by its dorsally compressed conical bifid sac, and by the broad triangular ridged apical lobe of its lip. The original specimen of this was collected on the western frontier of Sikkim, and for a long time no other specimen was obtained. Recently, however, plants have been obtained from eastern Sikkim. The characters in both western and eastern specimens are constant.

PLATE 304.—*Saccolabium affine*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column with anther *in situ*, and lip, *profile view*, 3 vertical section of the lip, 4 apex of the column with the anther *in situ*, 5 empty anther from below, 6 pollinia; *all enlarged*.

16. SACCOLABIUM PSEUDO-DISTICHUM, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, pt. 2, p. 341.

Stems slender, 6 to 9 in. long, slightly branching, pendulous. *Leaves* fleshy, lanceolate, the apex finely and minutely bifid, ·5 to ·75 in. long and ·2 to ·25 in., broad. Peduncle ·35 in. long, sub-umbellately 5- or 6-flowered. *Flowers* ·3 in. in diam., *bract* minute. *Sepals* and *petals* sub-equal, oblanceolate-oblong, spreading. *Lip* with a wide sub-hemispheric spur, side lobes absent; terminal lobe broadly cordate, blunt, entire, fleshy, concave, deflexed, quite without calli. *Column* very short. *Anther* shortly beaked. *Pollinia* two, entire, ovoid-globose; caudicle long, cylindric; gland deeply 2-lobed. *S. distichum*, Hook. fil. in Ann. Bot. Gard. V, 49, t. 73, *in part.*

Sikkim, at elevations of 6,000 to 8,000 feet; flowering time, August to October; Pantling No. 49; Clarke 36327; King 3052, 4949; Gamble 8013. Khasia Hills; Mann.

This grows along with *S. distichum*, Lindl., to which it is closely allied. As in that species, the sepals and petals are greenish with brownish-purple spots; the lip in this is yellow, except the terminal lobe, which is orange. The chief distinction between the two is to be found in the lip, which in this is entirely without calli of any kind, while in *S. distichum* the lip has two large calli situated at its base. The times of flowering of the two are, moreover, separated by four months.

PLATE 305.—*Saccolabium pseudo-distichum*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 vertical section of column and lip, 3 lower surface of anther, 4 apex of column with the pollinia *in situ*, the cap of the anther having been removed, 5 pollinia; *all enlarged*.

17. SACCOLABIUM TRICHROMUM, Reichb. fil. in Hamb. Gartenzeit, 1859, 51.

Stem pendulous, 1 to 3 feet long, clothed below with the sheaths of fallen leaves, above bearing 10 or 12 leaves. *Leaves* narrowly oblong, tapering slightly to the obliquely and bluntly bifid apex; the base jointed to the sheath, not narrowed; length 4·5 to 6 in., breadth ·5 or ·6 in. *Racemes* supra-axillary, about half as long as the leaves, divergent, secund, few-flowered. *Flowers* 1 in. long; *bract* broad, blunt, minute. *Sepals* spreading, sub-equal, narrowly oblong, sub-acute. *Petals* slightly shorter than the sepals but broader, obovate-oblong, apiculate. *Lip* adnate to the short foot of the column, consisting chiefly of an infundibuliform slightly curved blunt spur almost as long as the ovary and parallel to it; *spur* with two large projecting calli half way down its tube which almost touch, the anterior one sending a plate upwards which divides the upper part of the spur for a short distance into two chambers; side lobes erect, broadly triangular, blunt; apical lobe short, triangular, concave, acute, entire, without calli. *Column* rather long, with a somewhat curved foot half its own length. *Anther* depressed, with a long beak in front; *pollinia* two, globular; caudicle cylindric, dilated at its junction with the broad orbicular gland. Xenia Orchid. 119, t. 139; Hook. fil. Fl. Br. Ind. VI, 65; in Ann. Bot. Gard. Calc. V, 50, t. 75. *Saccolabium pallens*, Cathc. ex Lindl. in Journ. Linn. Soc. III, 35.

Sikkim, at elevations between 1,000 and 2,500 feet, common; in flower during July and August; Pantling No. 92; also in Bhotan. Assam; Simons.

The sepals and petals are of a pale straw colour with a central vertical band of pale pink; the spur is rose-coloured and the column white.

The spur is in this species distinctly divided into two unequal antero-posterior chambers for a short space near the mouth by a horizontal plate which (as shown in figs. 3 and 4) proceeds from the anterior callus. The spur is also constricted below this plate, and about its middle, by the calli which project from its back and front walls and almost divide it into an upper and a lower section. In these respects this is not a true *Saccolabium*, as that genus is understood in this work, there being in the spur of *Saccolabium* neither callus nor septum. Nor is it a true *Cleisostoma*, the spur of which genus is occluded not only by antero-posterior calli, but sometimes also by a plate proceeding from the back wall. Neither is it a *Sarcanthus*, in which genus there is, besides calli, a vertical antero-posterior septum dividing the spur into two lateral chambers. In fact there is as much justification for making this the type of a new genus as there was for the formation of *Cleisostoma* as a genus; for the presence of a horizontal plate (forming a small chamber) on the anterior wall is of as much importance as the presence of a plate on the posterior wall. But, in our opinion, there are already too many genera in this neighbourhood. We therefore leave this plant in *Saccolabium*, where it is placed by Dr. Reichenbach and Sir Joseph Hooker, being in entire agreement with the remark of the latter distinguished botanist (Fl. Br. Ind. VI, pp. 66, 71) that, but for the undesirable dislocation of synonymy which would result, it would be better to reduce both the genera *Cleisostoma* and *Sarcanthus* to *Saccolabium*.

PLATE 306.—*Saccolabium trichromum*, Reichb. fil. Part of a plant, *of natural size*. Fig. 1 a flower, 2 stalked ovary, column with anther *in situ*, and lip, 3 longitudinal section of column and spur, 4 transverse section of spur above the middle, 5 lower surface of empty anther, 6 pollinia *in situ* on the apex of the column, 7 the same removed; *all enlarged*.

52. Cleisostoma, Blume.

Epiphytes without pseudo-bulbs. *Stems* more or less elongated, leafy. *Leaves* coriaceous or fleshy, flat or semi-terete. *Inflorescence* leaf-opposed, racemose or paniculate. *Sepals* and *petals* adnate to the column, spreading, sub-equal. *Lip* sessile on the footless column, the base with a large saccate or infundibuliform spur, sometimes dilated at the apex, its cavity more or less closed by two calli the posterior of which is often bifid, and sometimes also by a dorsal scale, but never by a septum; the lateral lobes small or absent; the apical lobe thickened, concave. *Column* short, thick, with no foot. *Anther* depressed; pollinia two, often bifid; caudicle single. Species about 40; Eastern Asiatic and Australian.

Cavity of spur occluded by two calli, the dorsal one divided at the apex into two scale-like plates.
- Leaves semi-terete, channelled in front, their apices acute and sub-spinous . . . . . *1. C. armigerum.*
- Leaves flat but keeled.
  - Spur widely saccate, not dilated at the apex; apical lobe of lip triangular-hastate, its apex narrow and bifid; apices of leaves acute . . . . . *2. C. brevipes.*
  - Spur infundibuliform, dilated and notched at the apex; apical lobe of lip thick, triangular-ovate, acute, entire; apices of leaves broad, obliquely bifid . . . . . *3. C. apicatum.*

Mouth of spur occluded by two calli and by a semi-circular erose scale on the column; leaves broad, obtuse and obliquely bifid at the apex.	*4. C. Wendlandorum.*
Spur with rather thin calli, its mouth closed by a scale from the posterior wall	*5. C. bambusarum.*
Posterior callus of spur not bifid; dorsal or columnar scale none.	
Apical lobe of lip fleshy, convex, its edges erose; spur wide, saccate, blunt	*6. C. micranthum.*
Apical lobe of lip concave, its edges entire; spur narrowly cylindric	*7. C. gemmatum.*

1. CLEISOSTOMA ARMIGERUM, King and Pantling in Journ. As. Soc., Bengal, Vol. LXV, pt. 2, p. 123.

Stems erect, rigid, 2 to 4 in. long. *Leaves* very fleshy, semi-terete, channelled in front, the apex sub-spinous, not narrowed at the sheathing wrinkled base. *Racemes* extra-axillary, ·5 in. long. *Flowers* crowded, ·25 in. across. *Sepals* spreading, ovate-rotund, apiculate. *Petals* much smaller, also spreading, oblanceolate. *Lip* with a wide sacciform spur half as long as and parallel to the ovary, its edges with broad shallow triangular side lobes; apical lobe ovate, blunt, concave; the interior of the spur with opposing thick calli from the posterior and anterior walls, the latter much the larger and occluding the passage; the dorsal callus curved and dilated upwards, its upper surface produced into two broad scale-like teeth pointing outwards. *Column* short, adherent for half its length to the lip. *Anther* depressed; rostellum beaked; *pollinia* two, globose, bifid; caudicle stout, thickened at its junction with the pollinia; gland with two ovoid lobes with decurved margins.

Sikkim, at low elevations, common; in flower during September; Pantling No. 252.

The flowers are pale straw-coloured, flushed with pink. A coloured drawing of this has been in the Calcutta Herbarium since 1856, but until recently there have been no specimens, the original from which that drawing was made having been lost.

PLATE 308.—*Cleisostoma armigerum*, King and Pantling. A plant. Fig. 2 transverse section of a leaf, *of natural size*. Fig. 1 a flower, 3 side view of floral bract, ovary, column, anther *in situ* and lip, 4 transverse section of spur below the calli, 5 the posterior callus inside the spur, 6 longitudinal section of the ovary column and spur, 7 under surface of anther, 8 pollinia—*side and back views; all enlarged.*

2. CLEISOSTOMA BREVIPES, Hook. fil. Fl. Br. Ind. VI, 73.

Stems about as thick as a goose-quill, branching, pendulous, 8 to 16 in. long. *Leaves* thickly coriaceous, wrinkled, narrowly oblong-lanceolate, acute, not narrowed at the sheathing base; length 2·5 to 3·5 in., breadth ·4 to ·5 in. *Spikes* extra-axillary, much shorter than the leaves, pendulous, the rachis very stout, the pedicel short. *Flowers* crowded, ·4 in. in diam. vertically; *floral bract* broad, sub-acute, short. *Sepals* sub-equal, broadly ovate-elliptic, sub-acute, the dorsal somewhat concave. *Petals* oblanceolate, blunt, shorter than the sepals. *Lip* longer than the sepals, the base forming a short wide sac almost at right angles to the ovary, its mouth with triangular falcate side lobes; apical lobe fleshy, elongate, triangular-hastate with a narrow aristately bifid decurved apex. *Column* stout, with a large bifid callus at its base, hispid on the anterior surface and projecting into the spur to meet the thick callus on the anterior wall, and thus closing the orifice of the sac; dorsal scale none. *Anther* depressed,

not beaked; *pollinia* two, broadly ellipsoid or sub-globular, bifid; the caudicle slightly thickened near its apex, slender below; gland very large, 2-lobed. *Capsule* fusiform, striate, 1 to 1·5 in. long. Hook. fil. in Ann. Bot. Gard. Calc. Vol. V, 55, t. 82.

Sikkim, common in tropical valleys; in flower during August; Pantling No. 175. Assam.

The sepals and petals are yellow with broad brown bands on the midribs and edges; the lip is pale buff, except the apical lobe which is pure white.

PLATE 307.—*Cleisostoma brevipes.* Hook. fil. A plant, *of natural size.* Fig. 1 a flower, 2 side view of bract, ovary, column, anther and lip, 3 section of the preceding, 4 the bifid callus at the base of the column which protrudes into the mouth of the spur, 5 lower surface of anther, 6 apex of column after removal of the cap of the anther, showing the pollen masses, the caudicle and the gland *in situ*, 7 pollen-apparatus after removal; *all enlarged.*

3. CLEISOSTOMA SPICATUM, Lindl. in Bot. Reg. 1847, under t. 32.

Stem pendulous, as thick as a swan's quill, 6 to 14 in. long. *Leaves* coriaceous, oblong, slightly contracted at the sheathing base; the apex blunt, shortly unequally and broadly bifid, length 4 to 6 in., breadth 1·2 to 1·4 in. *Inflorescence* pendulous, leaf-opposed, about as long as the adult leaves; its peduncle stout, short, with a small wide annular sheath at the base; the *raceme* densely-flowered. *Flowers* ·4 in. long and ·25 in. across; *floral bract* lanceolate, much shorter than the puberulous ovary. *Sepals* sub-equal, broadly elliptic, the dorsal concave; the lateral pair spreading like the smaller sub-obovate-oblong petals. *Lip* longer than the sepals, adnate wholly to the sides of the column, consisting chiefly of an infundibuliform spur, dilated, compressed and minutely 3-notched at the apex; the mouth with very narrow erose side lobes; the interior contracted at two points by calli on the front and back walls; the posterior callus divided into two triangular recurved teeth; dorsal scale none; the apical lobe thick, triangular-ovate, acute. *Anther* depressed, long-beaked; *pollinia* two, globose; caudicle somewhat dilated near the apex; the gland minute, elongate, emarginate. Hook. fil. Fl. Br. Ind. VI, 72; in Ann. Bot. Gard. Calc. V, 55, t. 83. *Sarcanthus densiflorus*, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 136. *Saccolabium densiflorum*, Lindl. in Wall. Cat. 7311; Gen. and Spec. Orch. 220; in Bot. Reg. 1838, Misc. 56. *Ærides densiflorum*, Wall. MSS.

Sikkim, in the valley of the Teesta, at an elevation of 1,000 feet; in flower during June; Pantling No. 169. Tenasserim; Parish. Penang; Wallich, King. Perak; Scortechini, No. 2075. Borneo.

The flowers are yellow, mottled and banded with brownish-purple; the column is white.

PLATE 311.—*Cleisostoma spicatum*, Lindl. A plant, *of natural size.* Fig. 1 a flower, 2 bract, ovary, column, anther and lip, *seen from the side*, 3 section of the foregoing, 4 the callus on the dorsal wall of the spur, 5 apex of the column with the anther *in situ*, the stigma (*s*), 6 the same with the cap of the anther taken off, 7 the pollinia removed; *all enlarged.*

4. CLEISOSTOMA WENDLANDORUM, Reichb. fil. in Otto and Dietr. Algem. Gartenzeit, 1856, 219.

Stem very short. *Leaves* crowded, pendulous, somewhat keeled, oblong, obtuse and obliquely 2-lobed at the apex, slightly narrowed at the base, sessile, 5 to 9 in. long and

·9 to 1·35 in. broad. *Panicles* rigid, about half as long as the leaves, axillary, stout, usually 3-branched; the branches unequal, spikate. *Flowers* numerous, somewhat crowded, ·25 in. across; *floral bract* minute, triangular. *Sepals* and *petals* sub-equal, obovate-elliptic to sub-orbicular, blunt, concave, spreading; the dorsal sepal arching over the column, and the lateral pair embracing the sac of the lip. *Lip* slightly longer than the sepals and petals; the base with a wide short sub-globose spur as long as the ovary, its cavity contracted at the mouth by two pointed fleshy calli, the anterior callus larger than the posterior (or columnar) one; side lobes narrow, truncate, obscure; apical lobe fleshy, reniform. *Column* stout bearing a semi-circular erose scale; rostellum large, pointed and projecting forwards; *pollinia* two, sub-globose, grooved; the caudicle strap-shaped, slightly narrowed at each end, gland V-shaped. *Capsule* linear-oblong, ·85 in. long. Hook. fil. Fl. Br. Ind. VI, 74; Hook. fil. in. Ann. Bot. Gard. Calc. V, 57, t. 85. *C. callosum*, Reichb. fil. in Bonplandia (*not of Blume*). *Pomatocalpa spicatum*, Kuhl and Hasselt ex Reichb. fil. in Dietr. Algem. Gartenzeit, l. c.

Sikkim, in tropical valleys ascending to elevations of 1,500 feet; in flower during May and June; Pantling No. 135. Cachar; Keenan. Tenasserim; Parish. Andaman Islands; Berkeley, Kurz, King's Collectors.

The ground-colour of the flowers is pale yellow, flushed with pink about the neck of the spur. The apical lobe of the lip has two bright red spots.

PLATE 309.—*Cleisostoma Wendlandorum*, Reichb. fil. A plant, *of natural size*. Fig. 1 front view of a flower, 2 floral bract, ovary, and flower *in profile*, 3 column, *profile view*, and lip with the anther *in situ*, 4 longitudinal section of the preceding, 5 empty anther, 6 and 7 views of the pollinia, the latter with the caudicle flattened out to show the outline—*all enlarged*; 8 young capsule; *of natural size*.

5. CLEISOSTOMA BAMBUSARUM, King and Pantling.

Stem none or very short. *Leaves* fleshy, linear-oblong, acute, keeled and channelled, slightly narrowed to the base; length 1·5 to 4·5 in., breadth ·25 to ·3 in. *Inflorescence* pendulous, equalling or exceeding the leaves in length; its peduncle with three or four sheathing bracts; *raceme* about 12-flowered, its rachis thicker than the peduncle. *Flowers* ·35 to ·45 in. across; *floral bract* lanceolate, more than half as long as the ovary. *Sepals* sub-equal; the dorsal sub-orbicular, very concave; the lateral pair broadly ovate with broad bases, sub-acute. *Petals* obovate-rotund, clawed, shorter than the sepals. *Lip* with a wide spur more than half as long as the ovary, its apex dilated and truncate; the dorsal plate or scale thin, its apex resting on the thickened callus on the anterior wall; the mouth with short sub-quadrate erect lobes; apical lobe of lip very thick, triangular-ovate, acute, with a convexity in the middle. *Column* short, with a short incurved fleshy arm on each side of the rostellum; *pollinia* two, ellipsoid, compressed; the caudicle dilated and bifid at the apex, tapering to the small minute cordate gland. *Sarcanthus bambusarum*, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 124.

Bhotan, at the Rumpti Lake below Nimbong; elevation 1,500 feet; in flower during May; Pantling No. 211.

The dorsal sepal is brown externally, flushed with yellow; internally it is buff-coloured; the lateral sepals and petals are buff; the lip is also buff on the upper surface, with some brown streaks on the side lobes and a bold patch of yellow on the apical lobe.

All the specimens hitherto obtained of this have been found growing on the nodes of the stems of bamboos, their roots twining amongst the decaying bracts and scales found in these situations. No plants have ever been found growing on the internodes. The scale or plate proceeding from the back wall of the spur in this species is flattened, and somewhat resembles a septum. The plant, however, is, as we now believe, a true *Cleisostoma*, and we therefore transfer it from *Sarcanthus* in which genus we originally placed it.

PLATE 310.—*Cleisostoma bambusarum*, King and Pantling. A plant growing on the node of a living bamboo, *of natural size*. Fig. 1 sepals and petals separated, 2 a flower, 3 side view of bract, ovary, column and lip, 4 section of the foregoing, 5 front view of the end of the spur, 6 profile view of anther, 7 pollinia—*all enlarged*; 8 transverse section of a leaf; *of natural size*.

6. CLEISOSTOMA MICRANTHUM, King and Pantling.

Stem stout, compressed, 3 to 8 in. long, covered by leaf-sheaths. *Leaves* narrowly oblong, keeled, obliquely truncate and slightly bifid, the base shortly sheathed; length 2·5 to 3·5 in., breadth ·5 to ·6 in. *Racemes* leaf-opposed, longer than the leaves, the peduncle and rachis stout. *Flowers* numerous, but only a few expanding at a time, ·2 in. across; *floral bract* broad, blunt, less than half as long as the short sessile ovary. *Sepals* broadly ovate, obtuse, spreading. *Petals* smaller than the sepals, oblong, spreading. *Lip* fleshy, as long as the sepals; the base with a wide blunt spur adpressed to and as long as the ovary, its interior with two calli near the mouth, one on the back wall and a larger one on the anterior wall; dorsal scale absent; lateral lobes small; the apical lobe oblong, convex, blunt; the edges thin and erose, the upper surface smooth. *Column* very short, stout, with no foot, but with a large cheek-like protuberance on either side of the rostellum. *Anther* depressed, with a long pointed beak; *pollinia* two, obovoid, the caudicle triangular, cordate or oblong, much larger than the triangular gland. *Saccolabium micranthum*, Lindl. in Wall. Cat. 7300; Gen. and Spec. Orch. 220. Saunder's Refug. Botan., t. 110; Hook. fil. Fl. Br. Ind. VI, 59.

Sikkim, at elevations from 2,000 to 3,000 feet; in flower during July and August; Pantling No. 78. Westward along the range to Dehra Dhoon, and eastward to Bhotan; also in the Naga and Khasia Hills and in Tenasserim.

The sepals and petals are white with large pink spots, the lip is entirely pink or purple. The caudicle of the pollinia varies in form and is always fragile. In the Sikkim plant the spur of the lip equals the sepals in length, and the callus at the mouth of the spur is large and solitary, not double. As this callus protrudes so as to meet a smaller callus projecting from the posterior wall and thus to close the opening into the spur, the species is removed from *Saccolabium* to the genus *Cleisostoma*.

PLATE 312.—*Cleisostoma micranthum*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column with anther *in situ*, and lip, *side view*, 4 section of the foregoing, 3 lip, 5 apex of column, showing the processes by the sides of the rostellum, the stigma and the anther *in situ*, 6 under-surface of empty anther, 7 pollinia; *all enlarged*.

7. CLEISOSTOMA GEMMATUM, King and Pantling.

Stem slender, pendulous, 6 to 12 in. long. *Leaves* linear, curved, the margins much infolded, sometimes almost sub-terete, minutely 3-toothed at the apex, neither

narrowed nor sheathing at the base, 2·5 to 5 in. long, and about ·2 in. broad when unfolded. *Panicles* axillary, slender, longer than the leaves, their branches few and racemose. *Flowers* not crowded, only ·15 in. long; *floral bract* minute. *Sepals* and *petals* connivent; the sepals broadly oblong, obtuse; the petals smaller, obovoid. *Lip* longer than the sepals, fleshy, concave; its base with a stout cylindric blunt spur parallel to the ovary and nearly as long, its interior with a small posterior and a large anterior callus occluding the mouth; dorsal scale none; side lobes obscure; apical lobe ovate-rotund, blunt, entire, concave. *Column* very short, thick, bearing on its sides two translucent teeth. *Anther* dome-shaped, with a long beak in front; *pollinia* two, broadly ovoid, attached by a broad flat oblong caudicle to a much-elongated oblong gland. *Capsule* oblong, curved, sub-sessile, ·2 in. long. *Saccolabium gemmatum*, Lindl. in Bot. Reg. 1838, Misc. 50; Reichb. fil. in Walp. Ann. V, 885; Hook. fil. Fl. Br. Ind. VI, 55; in Ann. Bot. Gard. Calc., Vol. VI, Pt. 1, 46, t. 70.

Sikkim, at elevations between 2,000 and 6,000 feet, common; in flower during July and August; Pantling No. 126; Bhotan, Khasia and Jaintia Hills.

The prevailing colour in the flower and ovary of this is purple, the apical lobe of the lip and the inner surface of the petals being white. The specific name given to the plant by Lindley is *gemmatum*, and not *geminatum*, as it has sometimes been inadvertently written.

We have removed this and *Sacc. micranthum* from the genus *Saccolabium*, as the mouth of the spur in both is quite closed by the large calli which occur in that situation; whereas in *Saccolabium*, as limited by the late Mr. Bentham and by Sir Joseph Hooker, there is neither callus nor plate in the spur. In *Cleisostoma*, on the other hand, the spur is occluded by calli, or by a dorsal plate, or by both. In this and in *S. micranthum* there is no dorsal plate, but the occlusion of the mouth of the spur by calli is complete. Moreover, both of them have the *facies* rather of *Cleisostoma* than of *Saccolabium*. The difficulty which we found in dealing with *Saccolabium trichromum*, which has calli and a *ventral* plate in its spur, was met, as is explained in the note following our description of that species, by retaining it as an aberrent *Saccolabium* rather than by making a new genus for it, its *facies* being that of the latter genus.

PLATE. 313.—*Cleisostoma gemmatum*, King and Pantling. A plant, *of natural size*. Fig. 1 part of rachis, ovary and flower, *side view*, 2 bract, ovary, column with anther *in situ*, and lip, *side view*, 3 column, 4 section of column and lip, 5 anther, *side view*, 6 pollinia, caudicle and gland before depression, *side view*, 7 and 8 the same after depression; *all enlarged*.

53. Stereochilus, Lindl.

Epiphytal. *Stem* short. *Leaves* coriaceous, narrowly oblong, usually bifid at the apex. *Racemes* extra-axillary, drooping, lax, many-flowered, glandular-pubescent, (glabrous in one species). *Sepals* sub-equal, spreading. *Petals* smaller than the *sepals*, spreading. *Lip* about as long as the sepals, fleshy, sessile on the base of the column, spurred, obscurely 3-lobed; the side-lobes small, triangular, erect, acute or minutely bifid; the apical lobe much larger, concave; the interior of the spur occluded by two antero-posterior thick calli. *Column* short, nearly straight; rostellum subulate, horizontal, directed forwards or to one side. *Anther* depressed, apical, with a long beak; *pollinia* four, plano-convex,

attached by their backs in pairs to a long caudicle broad above but tapering to a small gland. Species three, all Indian.

Lindley's original description of this genus, as regards the structure of the lip, is not in harmony with the specimens on which he founded it. This is no doubt on account of his having worked on Herbarium material. We have therefore modified it and, as now defined, the genus differs from *Camarotis* in having a terminal, not a dorsal, anther; and also in having a spurred, distinctly 3-lobed lip, instead of a lip consisting almost entirely of a sac with very small obscure side and apical lobes and no spur.

Glabrous, flowers ·3 in. across . . . . . *1. S. bicuspidatus.*
Inflorescence pubescent, flowers ·75 in. across . . . . . *2. S. hirtus.*

1. Stereochilus bicuspidatus, King and Pantling.

Stem 3 or 4 in. long, with very numerous roots at the base. *Leaves* coriaceous, narrowly oblong, deeply and obliquely bilobulate at the apex, the lobules often erose; length 3·5 to 6 in., breadth ·8 to 1 in. *Inflorescence* from the stem below the leaves, slender, glabrous, usually longer than the leaves; the peduncle with a few minute distant sheaths. *Flowers* in *racemes* or shortly-branched *panicles*, numerous but not crowded, ·3 in. across; *floral bracts* minute. *Sepals* sub-equal, spreading, the dorsal obovate-elliptic, the lateral pair broadly elliptic. *Petals* oblanceolate, blunt, oblique, smaller than the sepals. *Lip* as long as the sepals, adnate to the column; the base with a spur nearly as long as and parallel to the ovary, cylindric towards the blunt non-dilated apex; the mouth infundibulate, its edges with broad rounded erose side lobes; the apical lobe broad, ovate, concave, acute; the interior of the spur with a smooth callus below the column and a much larger one on the anterior wall below the mouth, the two calli touching and occluding the entrance to the spur. *Column* short, thick; the rostellum long, bent to one side and slightly hooked at the apex. *Anther* depressed and with a long beak in front; *pollinia* four, orbicular, compressed, attached by pairs; the caudicle thickened in the middle, tapered at the apex, and also at the base to the small oval gland. *Capsule* cylindric, ridged, ·5 in long. *Cleisostoma bicuspidatum*, Hook. fil. Fl. Br. Ind., VI., 75.

Sikkim, at elevations of about 2,000 feet; in flower during July and August; Pantling No. 178. Khasia Hills; Mann. Tenasserim; Parish.

The flowers are yellowish, marked with pink along the midribs of the sepals and petals and on the lobes of the lip. The rostellum is long and twisted, and the pollinia are attached to the sides of the apex of the caudicle as in *Stereochilus hirtus*. In *Cleisostoma*, to which Sir Joseph Hooker (deceived no doubt by the drawings of the native artists of the Calcutta garden) referred this plant, the rostellum is shorter and quite straight; moreover the pollen-masses are attached behind the apex or at the extremity of the caudicle. We have therefore ventured to transfer this species to *Stereochilus*. The Sikkim plant differs, however, from the Khasia plant figured by Sir Joseph Hooker (Ann. Bot. Gard. Calc., V, t. 87, fig. B. 2) in having the calli inside the spur smooth, not pubescent, and it may be different from the Khasia one.

Plate 314.—*Stereochilus bicuspidatus*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 ovary, column, anther and lip, *side view*, 3 longitudinal section of the preceding, 4 front view of the apex of the column, showing the anther *in situ*, the twisted rostellum with the gland of the caudicle at one side, 5 the callus on the posterior wall of the spur below the column, 6 transverse section of the spur, 7 empty anther seen from below, 8 pollinia, side and back views; *all enlarged*.

2. STEREOCHILUS HIRTUS, Lindl. in Journ. Linn. Soc. III, 58.

Stem erect, stout, clothed with the sheaths of the leaves. *Leaves* narrowly oblong, rigid, fleshy, almost terete, narrowed towards the minutely bifid apex, widest at the base and jointed to the short rugulose sheaths; length 3 to 5 in., breadth ·5 in. *Racemes* axillary, decurved, longer than the leaves; the peduncle and rachis covered with short coarse glandular hairs; *raceme* sparsely flowered; *floral bract* minute, ovate, acute, hairy like the rachis and ovary. *Flowers* ·75 in. across, glabrous. *Sepals* spreading, oblong-lanceolate, blunt. *Petals* oblong, sub-spathulate, the apices blunt and crenate-serrate. *Lip* adnate to the base of the column, consisting of a wide compressed conical sac adpressed to the ovary, with triangular converging side lobes and with two large calli (one of them bilobed) at the mouth of its oblong cavity and just below the column; the limb oblong-ovate, blunt, concave. *Column* dilated at the base, with no foot; rostellum very large, curving downward to near the middle of the column. *Anther* depressed, with a very long beak; *pollinia* four, in two pairs, broadly ovoid, attached by their bases to a long thin flat caudicle ending in a small gland. *Sarcanthus hirtus*, Benth. in Gen. Plant. III, 576; Hook. fil. Fl. Br. Ind. VI, 35.

Sikkim, at Tendong, elevation 6,000 feet; in flower in June; Pantling No. 157. Khasia Hills, elevation 5,000 feet; Hooker and Thomson. Tenasserim; Parish.

The flowers of this are glabrous; the sepals and petals are pink, the lip white and pink, the column white and the anther purple. After the removal of the pollen-masses from the anther, the caudicle twists so that the pollinia acquire an oblique direction. This arrangement is no doubt to facilitate contact with the stigma when an insect to which the viscid disc has adhered visits another flower. Without such twisting, the pollinia would be prevented from reaching its stigma by the long stout rostellum which hangs down in front of that organ.

PLATE 315.—*Stereochilus hirtus*, Lindl. A plant. Fig. 8 transverse section of a leaf, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, 3 vertical section of ovary, column and lip, 4 anther from below, 5 pollinia *in situ*, the cap of the anther having been removed, 6 pollinia after removal, 7 section of spur between the calli and the tip; *all enlarged*. NOTE.—*Fig. 7 is erroneous in showing the partition in the spur as continuous; it really consists of two approximated flat calli.*

54. Camarotis, Lindl.

Epiphytal. *Stem* elongate, bearing distant coriaceous keeled leaves obliquely bifid at the apex. *Racemes* extra-axillary, many-flowered, lax. *Sepals* and *petals* spreading or reflexed, sub-equal. *Lip* sessile on the column, consisting of a thick-walled sac, the cavity narrowed by two calli and divided by a septum completely or partially into two chambers; side lobes small, obscure; the apical lobe small, thick, concave and entire or almost obsolete. *Column* twisted, without a foot; rostellum very long, narrow, subulate, curved, twisted to one side. *Anther* dorsal, depressed; *pollinia* four, in pairs, attached by their bases to a very long narrow caudicle tapering to a minute gland. Species four; Indian and one from the Philippines.

The other three species belonging to this genus are the Indian *C. purpurea*, Lindl. (*Ærides rostratum*, Roxb.); *C. pallida*, Lindl. (*Ærides pallidum*, Roxb.); and *C. Philippensis*, Lindl.

The first appearance of the genus *Camarotis* was in Wallich's Catalogue, in which he issued, under the number 7329 and the name *C. purpurea*, Lindl., the plant which Roxburgh had previously named

Ærides rostratum. In 1832 Lindley published in the Botanical Register his genus *Micropera*, to which he referred Roxburgh's *Ærides pallidum.* In 1851 Dalzell, oblivious of Lindley's genus of the same name, published in Hooker's Journal of Botany his genus *Micropera*, and under it he described two species (*M. viridiflora* and *M. maculata*), one of which (*M. viridiflora*) is, according to Lindley and Sir Joseph Hooker, a *Saccolabium.* The other (*M. maculata*) is also considered a *Saccolabium* by Messrs. Bentham and Hooker. Lindley, however, kept up Dalzell's name for the latter, as he had in the meantime discovered that his own *Micropera* is identical with *Camarotis*, to which he therefore himself reduced it (Journ. Linn. Soc. III, 38). *Camarotis* is allied to *Stereochilus*, from which it is, however, at once distinguishable by its dorsal anther, differently shaped lip, and elongated stems.

Sepals and petals broadly oblong; the lateral sepals connivent under the lip and partly adherent to it; flowers ·75 in. across . . .	*1. C. obtusa.*
Sepals and petals obovate, free, spreading; flowers ·25 in. across . .	*2. C. Mannii.*

1. Camarotis obtusa, Lindl. in Bot. Reg. 1844, Misc. 73.

Stem stout, erect, leafy, 8 to 10 in. long. *Leaves* coriaceous, horizontal, linear-oblong, slightly and obliquely bifid at the apex, not narrowed at the base, jointed to the short sheath; length 2 to 3 in., breadth ·3 to ·65 in. *Racemes* leaf-opposed, rigid, horizontal, about as long as the leaves when in flower, slightly longer in fruit; the peduncle with a few short sheaths; *raceme* with about ten flowers of which only two to four open at a time. *Flowers* (from the tip of the dorsal sepal to the tip of the lip) ·75 in. across; *bract* small, ovate, acute; rachis of raceme, ovary, and exterior of sepals sparsely furfuraceous. *Sepals* unequal, reflexed, the dorsal broadly oblong, its edges towards the apex reflexed; the lateral pair larger, oblong, sub-falcate, obtuse, adnate for about a third of their length to the sides of the lip, and for the rest connivent under it. *Petals* oblong, blunt. *Lip* fleshy, adnate to the base of the column and forming with it a right angle, its anterior wall cut away in the upper part, the apical half conical, its cavity partly occluded by two large calli from the back and front walls, the latter sending a septum across and dividing the cavity into an upper and a lower chamber; the latter chamber nectariferous, the side lobes along the mouth of the spur narrow and incurved; the apical lobe minute, narrowly triangular, also incurved. *Column* short; the rostellum very long, hooked at the apex, and twisted to one side. *Anther* depressed, beaked; *pollinia* four, plano-convex, sub-orbicular, attached by pairs to the long tapering slender caudicle; gland small, sub-rotund. *Capsule* linear, ridged, 1·5 in. long. Reichb. fil. in Walp. Ann. VI, 881. *Sarcochilus obtusus*, Benth. MSS. ex Hook. fil. Fl. Br. Ind. VI, 36. *Camarotis obliquirostris*, Parish MSS.

Sikkim, in tropical valleys at low elevations; flowering during August; Pantling No. 48. Tenasserim; Parish.

The flowers of this in Sikkim are white, the lip having a large yellow spot in front. The flowers originally sent to Lindley, and on which he founded his *C. obtusa*, were however described by him as of a dull dirty rose colour. It is therefore possible that the reduction of that species to this is incorrect.

Plate 316.—*Camarotis obtusa*, Lindl. A plant, *of natural size.* Fig. 1 front view of a flower, 2 profile view of floral bract, ovary, column, and lip, 3 vertical section of the lip, 4 front view of the column, showing the twisted rostellum, stigma, and the base of the labellum (*l*), 5 an empty anther, 6 and 7 pollinia; *all enlarged.*

2. Camarotis Mannii, King and Pantling.

Stems pendulous, slender, 8 to 12 in. long, leafy, sometimes branched, clothed with the ridged sheaths of fallen leaves. *Leaves* coriaceous, linear, acute and very minutely bifid at the apex, 3 or 4 in. long. and 3 or 4 in. broad. *Racemes* straight, rigid, shorter than the leaves, extra-axillary; the peduncle very short, stout like the rachis. *Flowers* not crowded, about ·25 in. in diam.; *bract* membranous, oblong, acute, one-third the length of the sessile scurfy ovary. *Sepals* and *petals* sub-equal, obovate, narrowed at the base, the petals slightly falcate, all reflexed. *Lip* an elongated sac at right angles to the ovary, adnate to the column, its anterior wall cut away at a right angle in the upper half; the edges of the mouth with two minute, oblong, obliquely truncate, erect side lobes, and between them a minute broad shallow triangular apical lobe; the margins of all the lobes slightly incurved; the apical lobe with a flat callus or scale immediately within it and projecting into the cavity of the spur; the posterior wall of the interior of the spur with a raised ridge, but forming no real septum. *Column* short, stout, twisted; the rostellum sigmoid and beak-like. *Anther* depressed; *pollinia* four, plano-convex, attached by pairs to the long tapering caudicle; gland small, oblong. *Sarcochilus Mannii*, Hook. fil. Fl. Br. Ind. VI, 36.

Sikkim, valley of the Teesta at an elevation of 1,200 feet; flowering during June and July; Pantling No. 173.

The flowers of this are very pale pink, the sepals, petals and lip being spotted near their bases with crimson.

Plate 317.—*Camarotis Mannii*, King and Pantling. A plant, *of natural size*. Fig. 1 flower, 2 bract, ovary, column with its foot, and the lip, 3 front view of the column with the anther *in situ* and the lip, the anterior wall of the saccate portion of the latter cut away so as to show the ridge along the posterior wall, 4 the lateral and apical lobes of the lip as seen from behind, showing the upper surface of the callus which lies behind the apical lobe and protrudes into the cavity of the spur, 5 lower surface of the anther, 6 apex of the column, showing the pollinia *in situ*, the cap of the anther having been removed, 7 pollinia; *all enlarged*.

55. Sarcanthus, Lindl.

Epiphytes, without pseudo-bulbs. *Stems* usually elongate. Leaves fleshy, terete or flat. *Inflorescence* extra-axillary, racemose or paniculate. *Sepals* sub-equal, all spreading or reflexed, or the dorsal concave and connivent over the column. *Petals* smaller than the sepals, spreading. *Lip* adnate to the base of the column or of its foot, rarely jointed; the base with an infundibuliform spur sometimes dilated at the apex, the interior with a callus both on the anterior and the posterior wall, and always divided into two lateral compartments by a vertical antero-posterior septum; lateral lobes small, more or less triangular and acute; apical lobe small, triangular or hastate. *Column* short, stout, often with a foot as long as or longer than itself. *Anther* depressed; *pollinia* two, bifid. Species about 35, eastern tropical Asia.

Leaves terete.
- Lip jointed to the foot of the column . . . . . 1. *S. appendiculatus*.
- Lip adnate to the broad foot of the column . . . . . 2. *S. filiformis*.

Leaves flat.
- Leaves 8 to 12 in. long; flowers in panicles; foot of column very short . 3. *S. pallidus*.
- Leaves 2·5 to 4 in. long; flowers in racemes, column with no foot . . 4. *S. secundus*.

1. Sarcanthus appendiculatus, Hook. fil. Fl. Br. Ind. VI, 67.

Stem erect, rigid, as thick as a goose-quill, 8 to 15 in. long, with a few sheaths near the base. *Leaves* fleshy, terete, obtuse, 3 or 4 in. long and about ·15 in. thick. *Inflorescence* extra-axillary, longer than the leaves, drooping; the peduncle with a few distant small sheaths, as long as the lax few-flowered *raceme*. *Flowers* ·6 in. long; *floral bract* triangular, blunt, minute. *Sepals* unequal, spreading; the dorsal broadly oblong, 3-nerved, the apex rounded; the lateral pair smaller, acute. *Petals* smaller than the lateral sepals, narrowly oblong, acute. *Lip* longer than the sepals, jointed to the foot of the column; the base with a long, somewhat compressed, narrowly infundibuliform spur with an obtuse, somewhat dilated, slightly emarginate tip; the side lobes broad at the base but suddenly narrowed to a conical point; the apical lobe fleshy, broadly triangular, decurved; the interior of the spur with a large projecting callus on both front and back walls near the mouth. *Column* short with a thick short foot. *Anther* depressed, its anterior edge produced into a short broad erose appendage; *pollinia* two, broadly triangular, their apices divaricating; caudicle abruptly contracted between the pollinia; the gland quadrate, at right angles to the caudicle. *Capsule* fusiform, boldly ridged, 1 in. in length. Hook. fil. in Ann. Bot. Gard. Calc., Vol. V, pt. 1, 51, t. 76; Ic. Plantar. t. 2136. *S. teretifolius*, Reichb. fil. in Trans. Linn. Soc. XXX, 136 (*not of Lindl.*) *Ærides appendiculatum*, Wall. Cat. 7315; Lindl. Gen. and Spec. Orch., 242.

Sikkim, in tropical valleys; in flower during August; Pantling No. 241. In Assam, Burma and Mysore.

The ground colour of the flowers is a warm buff with many longitudinal purple or brownish-purple markings, the apical lobe of the lip being pale lavender or pink.

Plate 318.—*Sarcanthus appendiculatus*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 profile view of floral bract, stalked ovary and flower, 3 longitudinal section of apex of ovary, column and lip, 4 callus on the back wall of the spur, 5 transverse section of spur, 6 lower surface of anther, 7 pollinia, caudicle and gland; *all enlarged*.

2. Sarcanthus filiformis, Lindl. in Bot. Reg. 1842, Misc. 61.

Stems slender, terete, distantly sheathed near the base, pendulous, 10 in. to 6 feet in length. *Leaves* hanging more or less to one side, terete, fleshy, obtuse, 8 to 10 in. long and about ·2 in. thick. *Inflorescence* extra-axillary, slender, shorter than the leaves; the peduncle short, sheathed at the base only, the *raceme* long and lax. *Flowers* ·45 in. long; *floral bract* short, broadly oblong, obtuse, scarious. *Sepals* oblong, blunt, the dorsal concave towards the apex, all reflexed. *Petals* linear, much smaller than the sepals, also reflexed. *Lip* fleshy, adnate to the foot of the column; the base with a long infundibuliform compressed sac; its mouth with auriculate infolded side lobes; the apical lobe small, triangular, horizontal; the interior of the spur 2-celled because of the septum passing between its front and back walls, and with a large triangular lobed hispid callus projecting from the latter and narrowing the cavities. *Column* with a broad base, tapered to the apex. *Anther* depressed, beaked. *Pollinia* two, elliptic, grooved, attached obliquely to the somewhat twisted caudicle; the gland small, oblong. *Capsule* clavate, about ·5 in. long. Bot. Mag., t. 4639; Walp. Ann. VI, 891; Lem. Jard. Fleur. I, 266; Hook. fil. Fl. Br. Ind. VI, 66.

Sikkim, common in tropical valleys; in flower during August and September; Pantling No. 52. Khasia Hills, Burma.

The sepals and petals are brown with their edges and midribs yellowish or buff. The lip is white, flushed on the apical lobe with pink.

PLATE 319.—*Sarcanthus filiformis*, Lindl. Part of a plant, *of natural size*. Fig. 1 a flower, 2 longitudinal section of apex of ovary, column and lip, 3 transverse section of the spur, 4 under surface of anther, 5 apex of column with pollinia *in situ*, 6 pollinia, after removal from anther; *all enlarged*.

3. SARCANTHUS PALLIDUS, Lindl. in. Bot. Reg. 1840, Misc. 78.

Stem very stout, short (4 to 6 in.), leafy to the base. *Leaves* coriaceous, flat, obliquely bifid at the obtuse apex, not narrowed to the loosely sheathing base; length 8 to 12 in., breadth 1·4 to 1·6 in. *Panicles* ascending, axillary, much longer than the leaves, much-branched and many-flowered; their peduncles slender, with a few distant tubular sheaths. *Flowers* ·4 or ·5 in. across; *floral bract* broad, very short. *Sepals* equal, spreading, broadly elliptic, blunt or sub-acute, the dorsal concave. *Petals* smaller than the sepals but of the same shape. *Lip* fleshy, longer than the sepals, adnate to the column; the base with a blunt cylindric spur rather shorter than the ovary, curved forwards, its mouth with broadly triangular side lobes; the apical lobe fleshy, ovate, acute, with an incurved apical beak; its upper surface with a vertical plate running down into the spur and dividing the latter into two chambers; the back wall of the spur with a large protruding fleshy 2-lobed callus just under the column. Column short, broad, with a very short foot. *Anther* depressed, shortly beaked; *pollinia* two, ovoid or sub-ovoid, bifid, the caudicle thin, the gland small. Lindl. in Journ. Linn. Soc. III, 39; Hook. fil. Fl. Br. Ind. VI, 68; in Ann. Bot. Gard. Calc. V, 53, t. 79. *S. racemifer*, Reichb. fil. in Walp. Ann. VI, 891. *S. tricolor*, Reichb. fil. in Bonplandia III, 219. *Saccolabium racemiferum*, Lindl. Gen. and Spec. Orch. 224. *Ærides racemiferum*, Wall. MSS. *Sarcanthus affinis*, Wall. MSS.

Sikkim, at elevations of from 2,000 to 4,000 feet; in flower during August; Pantling No. 43. Westward to Nepal and eastward to Bhotan. Khasia Hills, Burma.

The sepals and petals of this are dull brown edged with yellow, and the lip is white.

PLATE 320.—*Sarcanthus pallidus*, Lindl. Parts of a plant, *of natural size*. Fig. 1 a flower, 2 section of ovary, column and lip, 3 transverse section of spur, 4 apex of ovary with pollinia *in situ*, 5 pollinia removed, *seen from behind*, 6 lower surface of anther; *all enlarged*.

4. SARCANTHUS SECUNDUS, Griff. Notul. III, 362; Ic. Pl. Asiat., t. 336.

Stem slender (·15 in. in diam.), pendulous, 6 to 12 in. long. *Leaves* narrowly oblong-lanceolate, acuminate, abruptly narrowed at the sheathing base, channelled; length 2·5 to 4 in., breadth ·25 to ·35 in. *Racemes* pendulous, less than an inch long, few-flowered; the peduncle about ·5 in. long. *Flowers* ·25 in. across; *floral bract* ovate, sub-acute, much shorter than the stalked ovary. *Sepals* equal, ovate-elliptic, sub-acute, spreading. *Petals* smaller than the sepals, obovate-oblong, spreading. *Lip* fleshy, equal to the sepals, adnate to the column; the apical lobe sub-horizontal, concave,

oblong, acute; the base with a short blunt infundibuliform spur parallel to but much shorter than the ovary, with two short broad triangular side lobes at its mouth; its interior with an antero-posterior septum and a bulbous projecting callus from the front and back walls. *Column* very short and stout, without a foot. *Anther* depressed and with a long beak; *pollinia* two, ovoid, bifid; caudicle tapering; gland round, minute. *Capsule* ellipsoid, faintly ridged, ·5 to ·75 in. long. Hook. fil. Fl. Br. Ind. VI, 67; in Ann. Bot. Gard. Calc. V, 51, t. 77. *S. oxyphyllus*, Wall. MSS. in Herb. Calc. *Micropera pallida*, Lindl. in Wall. Cat. 7321 (*in part, not of Gen. and Spec. Orch.*).

Sikkim, at the base of the range and in the lower parts of hot valleys; Pantling No. 151. Sylhet, Assam, Khasia Hills, Chittagong.

The sepals and petals of this are pale yellow with intramarginal bands of brown. The lip is white, except its apical lobe which is pink. Griffith's specific name is inappropriate, as the flowers are not secund.

PLATE 321.—*Sarcanthus secundus*, Griff. A plant, *of natural size*. Fig. 1 a flower, 2 bract, stalked ovary, column, anther and lip, 3 section of part of the foregoing, 4 apex of column with pollinia in position, 5 pollinia removed, 6 empty anther from below; *all enlarged*.

56. Dendrocolla, Blume.

Epiphytal. *Stem* elongate, leafy, erect and with many roots. *Leaves* coriaceous, narrow. *Raceme* leaf-opposed, its rachis bearing large persistent equitant bracts, proliferous. *Sepals* and *petals* sub-equal, spreading, often linear, the lateral petals adnate to the foot of the column. *Lip* short, jointed to the column, with a sac or spur at its base, 3-lobed, the lateral lobes small, the apical lobe oblong. *Column* short, broad at the base, with a short foot. *Anther* depressed, 2-celled; *pollinia* four, in pairs, unequal, or two and deeply bifid, attached by a short caudicle to a small often curved gland. *Capsule* narrow, elongate. Species about six, mostly Malayan, one Indian.

The genus, as above limited, includes only the plants put by Blume into his first section, *Cuculla;* those of his sections *Tubera* and *Fornicaria* being excluded by their differently shaped lips.

DENDROCOLLA ARACHNITES, Blume Bijdr. 287, t. 67.

Stem erect, rigid, rather stout, 6 or 8 in. long, bearing six or eight horizontal leaves and many roots. *Leaves* coriaceous, narrowly oblong, minutely bifid at the apex, not narrowed at the slightly sheathing base, 3 or 4 in. long and ·6 to ·75 in. broad. *Inflorescence* leaf-opposed, slightly longer than the leaves, spreading, rigid; the peduncle with one or two short sheaths, persistent and bearing flowers for about three years; the *raceme* shorter than the peduncle; *floral bracts* distichous, equitant, broadly triangular, persistent. *Flowers* about 1 in. across, the stalked ovary about twice as long as the *bract*. *Sepals* and *petals* sub-equal, linear-oblong, acuminate, 1·25 in. long. *Lip* jointed to the column, less than one-third of the length of the sepals and petals, with a short wide posteriorly projecting sac at the base, 3-lobed; the lateral lobes small, their truncate apices directed forwards; the apical lobe oblong, tumid, blunt, puberulous; disc between the side lobes with a fleshy callus. *Column* short, broad at the base, narrower at the apex and with a short foot. *Stigma* small. *Anther* depressed, truncate in front; *pollinia*

four, in pairs, narrowly elliptic, very unequal, the posterior one in each pair very small; caudicle short, quadrate; gland narrow, curved. *Ærides Arachnites*, Lindl. Gen. and Spec. Orch. 238. *Thrixspermum Arachnites*, Reichb. fil. Xen. Orch. II, 121. *Sarcanthus Arachnites*, Reichb. fil. in Walp. Ann. VI, 498; Hook. fil. Fl. Br. Ind. VI, 41. *S. serræformis*, Reichb. fil. in Walp. Ann. VI, 498. *Liparis? serræformis*, Lindl. in Wall. Cat., 1946; Gen. and Spec. Orch. 33 (*in part*).

Bhotan, at the foot of the range east of the Jaldacca river; in flower during September; Pantling No. 463. Assam; Jenkins, Mann. Khasia Hills; Clarke. Tenasserim; Wallich, Parish. Penang; Kunstler. Distrib. Java.

The flowers of this are very short-lived; they open rather late in the morning, and by evening they have withered. They appear singly at intervals of two or three weeks, and the raceme continues growing for several years. In colour the sepals and petals are yellow and the lip is speckled with red. In the Malayan countries the rachis often attains a length of many inches. As the bracts persist, the flowering rachis has a pectinate appearance.

PLATE 322.—*Dendrocolla Arachnites*, Blume. A plant, *of natural size*. Fig. 1 a flower, 2 profile view of the apex of the raceme, showing the bracts of future flowers, the bract of an existing flower, its stalked ovary, column and lip, 3 front view and vertical section of lip, 4 apex of ovary and column with anther *in situ*, 5 empty anther, under surface, 6 apex of column, showing the pollinia and caudicle (*g*) and the stigma (*s*), 7 the pollinia after removal, front and back views; *all enlarged*.

57. Ornitharium, Lindl.

Epiphytic. *Stems* long, leafy. *Leaves* coriaceous, narrowly oblong, notched at the apex. *Racemes* extra-axillary, long, pendulous. *Flowers* rather small. *Sepals* and *petals* more or less oblanceolate, all spreading except the connivent dorsal sepal. *Lip* jointed to the foot of the column, fleshy, spur-like, with a narrow cavity, bearing at its mouth minute side and apical lobes; the cavity without callus or septum. *Anther* depressed, shortly beaked; *pollinia* two, ovoid-globose, the caudicle lanceolate, the gland small. A single species.

ORNITHARIUM STRIATULUM, Lindl. in Paxt. Fl. Gard. I, 188, fig. 117.

Stem pendulous, slender, woody, sheathed, 3 to 6 in. long. *Leaves* decurved, narrowly oblong, obliquely bifid at the apex, slightly narrowed at the base into a short stem-clasping sheath; length 3·5 to 7 in., breadth ·65 to ·85 in. *Racemes* pendulous, opposed to and usually longer than the leaves, many-flowered, their peduncles short and with a few short broad *bracts*. *Flowers* lax, ·5 in. in diam.; *floral bract* minute, lanceolate, the stalked ovary very slender. *Sepals* sub-equal, narrowly obovate, blunt, the lateral pair slightly falcate. *Petals* smaller than the sepals, oblong, sub-acute, slightly falcate. *Lip* jointed to the foot of the column, narrowly infundibuliform, contracted below the slightly bulbous tip, slightly constricted also at the mouth; the side lobes small, oblong, their blunt apices pointing backwards; apical lobe very short, truncate. *Column* very stout, slightly dilated towards the apex, its foot strongly introflexed, as long as and running almost parallel to itself; rostellum short. *Anther* depressed, 2-celled; *pollinia* broadly ovoid, their apices divergent, attached by a thick short caudicle to the small gland. *Sarcochilus suaveolens*, Reichb. fil. Xen. Orch., t. 140; Hook. fil. Fl. Br. Ind. VI, 33. *Ærides suaveolens*,

Roxb. Fl. Ind. III, 473. *Ornithochilus striatulus*, Herb. Calc. *Thrixspermum teres*, Reichb. fil. Xen. Orch. II, 121, 123 (*excluding all the synonyms except those given above*).

Sikkim, in tropical valleys at low elevations; Pantling No. 286. Chittagong and Tenasserim.

The sepals and petals of this are yellow with brown spots; the lip is also yellow at the base, but its upper surface is white and its tip dark-purple. The flowers are sweet-scented. The racemes appear to lengthen and to produce flowers at different periods during the year. The individual flowers live, however, only a single day. This is one of the plants included in the genus *Sarcochilus* as enlarged by Mr. Bentham. But, as its lip is a spur-like body with a narrow cavity throughout its whole length, and bearing at the mouth minute side lobes, we do not think it ought to be reduced to a genus which its author characterised as having a lip with very large side lobes and no spur. We do not find any other genus into which it can justly be reduced, and we therefore venture to resuscitate for it that originally formed for it by Lindley.

According to another view of the morphology of the flower of this plant, the whole lip consists of a spur jointed to the foot of the column, and mobile. On this view the lip has a narrow cavity extending its whole length and dilated at the apex. But, on neither view is the lip like that of *Sarcochilus*, as Robert Brown (its founder) understood that genus.

PLATE 323.—*Ornitharium striatulum*, Lindl. A plant, *of natural size*. Fig. 1 the sepals and petals separated, 2 lip, *front view*, 3 vertical section of lip, 4 floral bract, stalked ovary, column, its foot, anther *in situ*, and lip, *side view*, 5 column and its foot and anther, *front view*, 6 under surface of anther, 7 pollinia; *all enlarged*.

58. Tæniophyllum, Blume.

Small stemless epiphytes, leafless when flowering, pseudo-bulb none; roots large, flat, greenish. *Leaves* linear, few, or absent. *Scape* short, filiform, simple, bearing a few minute flowers in a spike. *Sepals* and *petals* sub-equal, spreading, free or connate at the base, the lateral sepals sometimes attached to the lip. *Lip* adnate to the base of the column, conspicuously saccate or spurred, side lobes short or absent; mid-lobe fleshy, broad and short, or elongated and narrow. *Column* short, thick. *Anther* 2-celled; *pollinia* four, more or less broadly ovoid, attached in pairs by a caudicle to a gland. Species about 15; Indian, Malayan and Australasian.

Apex of lip with a recurved spike-like process . . . . . *1. T. retro-spiculatum.*
Apex of lip broad, obtuse . . . . . *2. T. crepidiforme.*

1. TÆNIOPHYLLUM RETRO-SPICULATUM, King and Pantling.

Leafless; the roots large, numerous and flat. *Scape* about ·75 in. long, bearing at its apex one or two minutely bracteolate flowers ·2 in. long. *Sepals* and *petals* sub-equal, linear-lanceolate, wide-spreading, the lateral sepals inserted on the sides of the lip. *Lip* linear-lanceolate, with a globose spur at the base, the apex with a retrorse tooth, the base sub-gibbous, side lobes none, the mouth of the spur contracted. *Column* very short. *Pollinia* four, broadly elliptic; the caudicle short, dilated below the *pollinia*, the gland ovate. *Sarcochilus retro-spiculatus*, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt 2, 340.

Sikkim, at elevations of about 5,000 feet; flowering in June; Pantling No. 165.

A very inconspicuous species, remarkable for the curious retroflexed apical spicule-like appendage of the lip. The flowers open singly, they are green in colour.

PLATE 324.—*Tæniophyllum retro-spiculatum*, King and Pantling. A plant growing on a tree-branch, *of natural size*. Fig. 1 a flower, 2 side view of apex of ovary, column and lip, 3 lip with its spur, *front view*, 4 and 5 anther as seen from above and from below, 6 pollinia; *all enlarged*.

2. TÆNIOPHYLLUM CREPIDIFORME, King and Pantling.

A minute leafless plant with comparatively large spreading roots. *Raceme* erect, ·35 in. long. *Flowers* ·15 in. long, distichous, opening singly; *bract* ovate, minute. *Sepals* sub-equal, ovate, blunt, concave, incurved; the lateral pair attached to the sides of the column. *Petals* shorter than the sepals, lanceolate. *Lip* sessile on the column, forming a roundish cup with entire edges; spur dilated, horizontal, pilose just inside its mouth, about as long as the lip. *Column* very short. *Anther* thin, with a slightly deflexed fleshy lip. *Pollinia* four, broadly ovoid, attached by pairs to a single thread-like caudicle; gland ovate. *Ovary* long, sub-sessile; *fruit* 1 in. long, cylindric. *Sarcochilus crepidiformis*, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, Pt. 2, 340.

Sikkim, in tropical valleys; flowering in September; Pantling No. 193.

The sepals and petals of this curious little plant are greenish, the lip is white, and the stigma has purple margins. It is named from the resemblance of the combined lip and spur to a slipper or last.

PLATE 325.—*Tæniophyllum crepidiforme*, King and Pantling. A plant growing on a branch of a tree, *of natural size*. Fig. 1 bract, ovary and flower, 2 part of ovary, column and lip, *side view*, 3 lip and portion of spur, 4 column and apex of ovary, anther (*a*), rostellum (*r*), stigma (*s*), 5 anther, lower surface, 6 pollinia; *all enlarged*.

59. Podochilus, Blume.

Stems tufted, usually slender, erect or diffuse. *Leaves* numerous, uniform, flat; or equitant and laterally compressed. *Inflorescence* terminal or leaf-opposed. *Flowers* minute, spicate or racemose, *bracts* persistent. *Sepals* and *petals* connivent or erecto-patent; the lateral sepals united at the base to form a wide sac or false mentum. *Lip* clawed, jointed to the produced foot of the column, sometimes with long basal lobes, ? mobile. *Column* very short; rostellum terminal, triangular, erect, bifid. *Anther* dorsal; *pollinia* four, in two pairs; each pair enclosed in a funnel-shaped cup attached to a short free caudicle, the caudicles inserted on a single small or large gland. Species about 12, Indo-Malayan.

Leaves equitant, apex of lip bifid	1. *P. cultratus*.
Leaves not equitant, apex of lip entire, acute	2. *P. khasianus*.

1. PODOCHILUS CULTRATUS, Lindl. in Wall. Cat. 7336.

Stems 6 in. long, clothed throughout with equitant flattened falcately lanceolate acute leaves ·65 in. long and ·25 in. broad. *Raceme* slender, terminal, about ·5 in. long, 2- to 4-flowered, often producing one or two roots at the base. *Flowers* ·2 in. long; *floral bract* broadly ovate, cuspidate, about equal in length to the sessile ovary

Sepals ovate, acute. *Petals* trapeziform, blunt or sub-acute. *Lip* oblong, slenderly attached on the under side and in front of the gibbous base to the much-produced foot of the column (see fig. 2), doubtfully mobile, flat or very slightly deflexed from the middle; the apex blunt, bilobulate, the disc smooth throughout. *Column* very short. *Anther* dorsal, curved, beaked. *Stigma* a shallow pouch, with an erect acute arm on either side; *pollinia* four, in pairs, each pair held within a funnel-shaped process and supported by a slender geniculate free caudicle; the two caudicles attached to the small shield-shaped gland. Lindl. Gen. and Spec. Orch. 234; in Journ. Linn. Soc. III, 37; Hook. fil. Fl. Br. Ind. V, 80.

Sikkim, at elevations from 2,000 to 3,000 feet; in flower during September and October; common; Pantling No. 188. Westward along the range to Nepal; eastward to Assam, Cachar and Burma.

The flowers are white, slightly flushed with pink.

PLATE 326.—*Podochilus cultratus*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 side view of bract, ovary, column with anther *in situ* and lip, 3 petals, 4 lip, 5 column and apex of ovary, the stigma (*s*), 6 empty anther, 7 pollinia; *all enlarged*.

2. PODOCHILUS KHASIANUS, Hook. fil. Ic. Pl. 2146.

Stems 4 to 6 in. long, simple, slender, sub-erect. *Leaves* coriaceous, linear-lanceolate, acute, sub-falcate, somewhat tapered to the base and articulated to the very short sheath, ·35 to ·6 in. long. *Raceme* terminal, erect, about ·25 in. long. *Flowers* three or four, distichous, ·15 in. long; *floral bract* exceeding the sessile ovary, broadly ovate, acute, persistent. *Sepals* ovate, sub-acute, connate below, the lateral pair forming a short wide sac (or mentum) at the base. *Petals* ovate-oblong, blunt, narrowed at the base. *Lip* oblong, sagittate at the base, the narrow basal lobes with a claw between them attaching the lip to the column, the margins slightly incurved and minutely ciliolate towards the acute apex, the upper surface smooth. *Column* short, stout; rostellum very broad, blunt. *Stigma* pouched and with a narrow transverse slit for its mouth. *Anther* dorsal; *pollinia* clavate, each pair enclosed in a funnel-shaped process ending in a short free caudicle; the gland large, oblong, bifid below. Hook. fil. Fl. Br. Ind. VI, 81. *P. microphyllus*, Wall. Cat. 7335B; Lindl. Gen. and Spec. Orch. 234 (*in part*); in Journ. Linn. Soc. III, 37.

Sikkim, on Sittong, at elevations of 5,000 to 6,000 feet; in flower during September; Pantling No. 187. Khasia Hills; Hooker and Thomson. Assam; Simons.

The flowers are white slightly flushed with yellow. The foot of the column is produced along the front of the ovary with which it is adnate, and with the lateral sepals it forms a small mentum.

PLATE 327.—*Podochilus Khasianus*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, *side view*, 2 bract, ovary, column and lip, *side view*, 3 petals, 4 lip, 5 empty anther, lower surface, 6 column, 7 pollinia; *all enlarged*.

60. Risleya, *new genus*, King and Pantling.

A small aphyllous terrestrial herb, without tuber or pseudo-bulb. *Scape* 2 to 5 in. long with two sheaths at the base. *Flowers* minute, fleshy, densely crowded in a short *raceme*. *Sepals* and *petals* sub-equal, oblong, blunt, spreading. *Lip* adnate to the base of

the column, about as long as the sepals, broadly ovate, very concave, fleshy, slightly crenulate near the base, otherwise entire; the apex blunt but with a small upturned apiculus. *Column* short, terete; rostellum stout, elongate. *Anther* dorsal, persistent, membranous, two-celled; the cells quite free and distinct, each dehiscing transversely by the broad blunt apex. *Pollinia* four, in two pairs, waxy; both pairs sessile on the rather large oblong fleshy gland, caudicle none.

An anomalous genus with the pollen of *Vandeae*, and the habit and general appearance of *Aphyllorchis*. The waxy nature of the pollinia and their attachment to a gland make it, however, impossible to include it in the latter genus. We find no genus in which it can be placed, and we have therefore founded one for its reception, naming it in honour of the Honourable H. H. Risley, C.I.E., of the Bengal Civil Service, one of the Secretaries to the Government of Bengal, a distinguished ethnologist and author of an important work on the *Tribes and Castes of Bengal*.

Risleya atropurpurea, King and Pantling.

Height of the whole plant 2·5 to 5 in. *Sheaths* at the base of the leafless scape wide, tubular, blunt, ·5 to 1 in. long. *Raceme* ·5 to 1·5 in. long; the *flowers* very numerous, inverted, ·06 in. across; the *floral bract* as long as the stalked twisted ovary. *Petals* rather narrower than the sepals, rostellum projecting.

Sikkim, near Jongri; at an elevation of 13,000 feet; in flower during June and July; Pantling No. 451.

The flowers are of a deep blackish-purple colour.

Plate 328.—*Risleya atropurpurea*, King and Pantling. Two plants, *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther *in situ*, and lip, *in profile*, 3 lip, 4 apex of ovary, column with anther *in situ*, *side view*, 5 summit of the ovary, showing the two empty anther cells and the rostellum (*r*), 6 pollinia; *all much enlarged*.

61. Ceratostylis, Blume.

Epiphytic herbs with crowded stems without pseudo-bulbs. *Stems* tufted, simple and rush-like or branched, sheathed, with usually only one leaf. *Leaf* narrow, coriaceous, fleshy, or sub-terete. *Flowers* minute, solitary or in small clusters and sometimes enveloped in a cymbiform sheath with scarious bracts. *Sepals* sub-equal, the lateral pair broad at the base and forming a mentum with the foot of the column the lateral sepals and the base of the lip. *Petals* narrower than the sepals. *Lip* spathulate, clawed, expanded, the apex thickened and fleshy. *Column* short, deeply two-lobed, each lobe bearing a stigmatic area near the apex of its inner surface. *Anther* dorsal, lying in the sinus between the lobes of the column; foot of the column long, narrow. *Pollinia* eight, attached to a common membrane and that in turn to a gland. Species probably about 10; Malayan, Indian and Australasian.

Ceratostylis teres, Reichb. fil. in Bonplandia, II, 89.

Stems crowded, rising from a dense fibrous rhizome, terete, rush-like, sheathed at the base, erect or curved, bearing a single terete leaf at the apex jointed to and in the same line with the stem. *Head* of flowers from the leaf-joint, ·25 to ·35 in. in diam.;

sessile, subtended by a few scarious sheathing bracts. *Flowers* sparsely pubescent, ·1 in. long; *floral bract* small, scarious, much shorter than the ovary. *Sepals* sub-equal, ovate-lanceolate, acute, spreading. *Petals* broadly lanceolate, acute. *Lip* narrowly spathulate, the claw with undulate edges, the apex clavate; the upper surface with two raised lines from base to apex, granular near the apex. *Column* short, deeply bilobed, each lobe with a stigmatic surface on its inner face; the *anther* lying in the sinus between the lobes and on a lower level than the two stigmatic surfaces (? distinct stigmas); foot much longer and narrower than the column, and forming with the base of the lip a long narrow somewhat curved sac; *pollinia* eight, clavately ellipsoid, attached to a large membrane and that in turn to a cordate gland. *Capsule* ellipsoid, ·2 in. long. Reichb. fil. in Walp. Ann. VI, 470; Hook. fil. Fl. Br. Ind. V, 825. *Appendicula teres*, Griff. Notul III, 359; Ic. Pl. Asiat., t. 332.

Sikkim, in the valley of the Teesta at an elevation of 1,000 feet; Pantling No. 229; in flower during May and June. Upper Assam; Griffith, Watt. Khasia Hills; J. D. Hooker.

The flowers are white, the end of the lip alone being yellow. The structure of the column is very remarkable. It is divided into two lobes by a deep sinus at the bottom of which lies the anther, the pollinia being quite concealed, while the gland (although visible in front) does not project from the cleft between the lobes. The two halves of the stigma lie on the inner or opposing surfaces of the lobes of the column. Each is of an obovate acute shape (the broad ends being uppermost); and the two lower and acute ends join in the sinus between the lobes, and thus forming a narrow belt from which the gland connecting the pollinia is derived.

PLATE 329.—*Ceratostylis teres*, Reichb. fil. A plant, *of natural size*. Fig. 1 side view of a flower, 2 side view of floral bract, ovary, column and lip, 3 front view of column and its foot (the ovary being behind), showing the two lobes of the column with the two stigmatic surfaces (marked *s*) and of the anther, (the gland of the pollinia being marked *g*), 4 inner surface of one of the lobes of the column, showing the stigmatic surface (marked *s*), 5 the lip, 6 anther, 7 pollinia; *all enlarged*.

62. Appendicula, Blume.

Stems tufted, slender, leafy, often compressed. *Leaves* numerous, uniform, flat. *Inflorescence* terminal or leaf-opposed, short. *Flowers* in racemes spikes or heads, minute; *floral bract* persistent. *Sepals* connivent, the lateral pair connate at the base and adnate to the long foot of the column to form a mentum. *Petals* linear, elliptic-oblong or obovate. *Lip* erect, adnate to the foot and sometimes to the sides of the column. *Column* very short; rostellum erect, bifid. *Anther* dorsal, erect; *pollinia* eight, (four often imperfect), attached by fours to a slender elongate caudicle and small gland. *Capsule* minute. Species about forty; tropical Asiatic, Australian and Polynesian.

APPENDICULA BIFARIA, Lindl. in Hook. Kew Journ. Bot. VII (1855), 35.

Stems slender, unbranched, 10 to 24 in. long. *Leaves* lanceolate, sub-acute, minutely bilobulate at the apex and often apiculate between the lobules; the base sessile and jointed to the short sheath; length ·9 to 1·25 in., breadth ·35 to ·4 in. *Racemes* chiefly terminal, rarely leaf-opposed, half an inch long, or shorter, 6- to 8-flowered. *Flowers* ·15

to ·25 in. long; *floral bract* lanceolate, acuminate, longer than the ovary, ultimately reflexed. *Sepals* oblong, obtuse. *Petals* ovate. *Lip* as long as the sepals, narrowly oblong, blunt, fleshy, its upper surface with a superposed horse-shoe-shaped appendage slightly constricted beyond the middle and with a globose callus near its apex. *Column* long, its apex with two pointed obliquely truncate or bifid processes as long as the rostellum; *pollinia* eight, unequal, clavate, attached by fours to a single caudicle; gland minute, brown. *Capsule* turgidly ellipsoid, ·25 in. long. Hook. fil. Fl. Br. Ind. VI, 82; Benth. Fl. Hong-Kong, 358; Reichb. fil. in Walp. Ann. VI, 893. *A. reduplicata*, Reichb. fil. Ot. Hamb., 45.

Sikkim, in tropical valleys; in flower during August; Pantling No. 288. Cachar; Keenan. Tenasserim; Helfer, No. 5221 (Kew Distrib.). Perak; Scortechini, No. 1866. Pahang; Ridley, No. 2370.

The flowers are white flushed with yellow, the gland of the pollen-masses is brown. The lip is very curious and gives the idea that a second lip, rather smaller than the real one, is laid on top of the latter. This no doubt was the origin of Reichenbach's specific name *reduplicata*.

PLATE 330.—*Appendicula bifaria*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column with anther *in situ*, and lip, *side view*, 3 lip, showing the globose sub-apical callus and the superposed laminar process, 4 vertical section of the lip, 5 column and its foot, at the apex the two processes and between them the rostellum, 6 under surface of anther, 7 pollinia; *all enlarged*.

63. Thelasis, Blume.

Epiphytes, with small few-leaved pseudo-bulbs or with short compressed stems and equitant leaf-sheaths. *Leaves* narrowly oblong, flat or loriform. *Inflorescence* from the base of the pseudo-bulb, sparsely sheathed. *Flowers* inverted, minute, in spikes, their texture cellular. *Sepals* connivent, sub-equal, concave, keeled or winged. *Petals* narrow, membranous. *Lip* sessile on the base of the column, ovate or oblong, erect. *Column* very short, with no foot; the rostellum terminal, large. *Anther* dorsal, elongate, erect, 8-celled; *pollinia* eight, minute, globose, attached by granular elastic threads to the slender caudicle; gland long, linear. *Capsule* small, turgid. Species about 14, in tropical Asia and in the islands of the Pacific.

Leaves 1 to 3 in. long, lip with side lobes	*1. T. pygmæa.*
Leaves 4 to 6 in. long, lip with no side lobes	*2. T. longifolia.*

1. THELASIS PYGMÆA, Lindl. in Journ. Linn. Soc. III, 63.

Pseudo-bulbs ovoid-globose, ·4 to ·65 in. in diam., bearing at the apex one or two linear-oblong fleshy leaves, minutely and obliquely bifid at the apex, narrowed at the sessile base; 1 to 3 in. long and ·2 to ·45 in. broad. *Scape* longer than the leaves, rising from the base of the pseudo-bulb, sheathed at the base and at intervals above; *raceme* from ·5 to 1 in. long. *Flowers* crowded, ·1 in. long; *floral bract* ovate, acuminate, as long as the ovary, scarious, persistent. Dorsal *sepal* ovate-lanceolate, acute; the lateral pair linear-oblong, concave, keeled. *Petals* oblong, blunt, 1-nerved, their apices recurved. *Lip* somewhat shorter than the sepals, oblong, blunt; the lateral lobes shallow, broad. *Column* tapering to the apex; the rostellum long, minutely bifid. *Anther* dorsal; *pollinia* globose, resting on a large mass of granular elastic tissue; caudicle single, slender; gland linear,

two-thirds of the length of the caudicle. *Capsule* subcylindric, tumid, ·2 in. long. Par. and Reichb. fil. in Linn. Trans. XXX, 145; Reichb. fil. in Walp. Ann. VI, 923; Hook. fil. Fl. Br. Ind. VI, 86. *Euproboscis pygmæa*, Griff. in Calc. Journ. Nat. Hist. V, 371, t. 72; Wight Ic. 1732.

Sikkim, at low elevations; in flower during August and September; Pantling No. 235. Malabar; Jerdon. Tenasserim; Parish. The flowers are pale green.

PLATE 331.—*Thelasis pygmæa*, Lindl. A tuft of plants, *of natural size*. Fig. 1 part of rachis, bract, ovary and flower, *side view*, 2 petals, 3 bract, ovary, lip and column, *seen from behind*, 4 lip, 5 view of the column from below, 6 anther, 7 pollinia; *all enlarged*.

2. THELASIS LONGIFOLIA, Hook. fil. Ic. Plantar. t. 2155.

Pseudo-bulbs conical, ·5 to ·75 in. long, bearing at the apex a single narrowly oblong or occasionally somewhat oblanceolate leaf, blunt and very minutely bifid at the apex and narrowed to the sessile base, 4 to 6 in. long and ·5 to ·7 in. broad. *Scape* from a developing pseudo-bulb, slightly longer than the adult leaf, with one or two scattered, short, thick, spreading sheaths along it and also several at the base. *Raceme* 1 to 2 in. long. *Flowers* numerous but not crowded, minute, ·2 in. long; *bract* broadly ovate, acute, much shorter than the ovary. *Sepals* without keels; the lateral pair ovate, blunt, the dorsal longer and narrower. *Petals* narrowly ovate, sub-acute. *Lip* elliptic, blunt, minutely bifid at the apex, otherwise entire, without side lobes, somewhat thickened in the middle near the base, the upper surface quite smooth. *Column* tapering to the apex; the rostellum long and narrow. *Anther* long-beaked, 2-celled, each cell with four compartments; *pollinia* broadly elliptic; the caudicle very long and slender, slightly dilated at the apex; gland small, oblong. Hook. fil. Fl. Br. Ind. VI, 87.

Sikkim, in tropical valleys; in flower during July and August; Pantling No. 223. Khasia Hills. The flowers are green in colour.

PLATE 332.—*Thelasis longifolia*, Hook. fil. A group of plants, *of natural size*. Fig. 1, flower with ovary and bract, *side view*, 2 lip, 3 bract, ovary, column, anther, and lip, from above, 4 view of the column from underneath, 5 anther, 6 pollinia; *all enlarged*.

64. Phreatia, Lindl.

Coespitose plants, often minute, with or without pseudo-bulbs. *Leaves* not plicate, articulated on rather wide equitant sheaths. *Scape* interfoliar and from the base of the pseudo-bulb, erect, racemose or spicate, many-flowered. *Flowers* minute, resupinate, expanding centrifugally. *Sepals* equal, connivent or spreading; the lateral pair adherent to the column. *Petals* narrower than the sepals. *Lip* fleshy, entire, decurved, adnate to the short foot of the column, broad or narrow. *Column* short, with a broad apex; the rostellum small, erect on the front edge of the truncate apex, bifid. *Anther* occupying the apex of the column; the *pollinia* eight in two rows, attached to a narrow caudicle lying horizontally and attached at a right angle to a gland contained in the cleft of the vertical rostellum. *Capsule* minute, ovoid. Species about ten, Malayan and Pacific Islands.

We have removed this genus from *Epidendreae* to *Vandeae*. From the extremely delicate texture of the flowers, it is impossible to make out the polliniar structure with certainty in dried specimens. Very careful dissections of the living flowers have shown us that the eight pollen-masses are attached to a caudicle which ends in an elongated gland situated in the fork of the vertical bifid rostellum. The

position of the anther at first glance appears to be erect, but a minuter examination shows that the pollinia and their caudicle lie horizontally on the broad truncate apex of the column. On the edge of this truncate apex stands the bifid erect rostellum, and in its cleft lies the gland to which the horizontal caudicle attaches itself. The genus is allied to *Thelasis* and, as Sir Joseph Hooker remarks in Ic. Plant. sub t. 2155, the texture of the petals in both genera is of the same soft, lax, succulent nature.

Phreatia elegans, Lindl. Gen. and Spec. Orch., 63.

Pseudo-bulbs tufted, ovoid, compressed, ·75 in. long. *Leaves* thickly membranous, narrowly elliptic, sub-acute or acute, somewhat narrowed to the large tubular sheath, 4 to 6 in. long and about ·75 in. broad. *Scape* erect, much longer than the leaves, proceeding from the base of a pseudo-bulb bearing about three distant convolute sheaths half an inch long; the *raceme* about 4 in. long, densely-flowered, the flowers opening from above downwards or sometimes from the centre towards the base and apex. *Flowers* minute (only ·125 in. across), white; the *bract* lanceolate, equalling or somewhat longer than the sessile ovary. *Sepals* sub-equal, ovate, acute, spreading; the *petals* narrower. *Lip* oblong, entire, sessile on the narrow foot of the column, deflexed about the middle, its upper surface hispid or smooth, grooved down the midrib. Rostellum bifid, erect; *pollinia* sub-rotund, cohering to a single thin caudicle; the gland long, narrow. Lindl. in Journ. Linn. Soc. III, 61; Hook. fil. Fl. Br. Ind. V, 811. *Thelasis elegans*, Blume Mus. Bot. Lugd. Bat. II, 187.

Sikkim, at Choongthang; elevation 6,000 feet; in flower in August; Pantling No. 295. Khasia Hills; G. Mann, King's Collectors.

Plate 333.—*Phreatia elegans*, Lindl. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 lip, 3 column with anther *in situ*, showing polliniar gland (*p g*) and stigma (*s*), 4 front view of the same, the anther having been removed to show better the forked rostellum (*r*), 5 floral bract, ovary, column and its foot, anther and lip, *side view*, 6 lower surface of anther, 7 pollinia; *all enlarged*.

Tribe IV.—LISTEREAE.

Anther terminal (dorsal in *Epipactis*), *pollinia* two or four, cohering by their sides, without gland or caudicle (a rudimentary caudicle in *Epipogum*); pollen powdery, granular or in small masses, never waxy.

Anther truly terminal.
- Pollinia with small thin caudicles but no gland, lip spurred . . . . *65. Epipogum.*

Pollinia without caudicles.
- Lip flat, neither clawed spurred nor saccate, pendulous and usually at right angles with the curved, more or less elongate, always inappendiculate, column; sepals and petals free, spreading or reflexed; leaves two (absent in one species) . . . . . *66. Listera.*
- Lip not pendulous, transversely elliptic, neither clawed spurred nor saccate; its upper surface somewhat concave and with two elongated tooth-like calli near its base; column with a short transverse horizontal sub-truncate process near its middle, and at its base a sub-erect tongue-like 2-lobed process . . . . . *67. Pantlingia.*

Lip concave or convolute, not clawed, spurred or saccate, rarely pendulous; sepals petals and column various.
Saprophytes or parasites with brown or yellowish stems, usually leafless.
Sepals united, pollinia two or four.
Sepals united into a ventricose tube near the mouth of which the minute petals are attached; pollinia two . . . . . 68. *Gastrodia.*
Sepals and petals united into a 5-toothed tube; the dorsal sepal and petals forming an upper and the lateral sepals a lower lip; pollinia four . . 69. *Didymoplexis.*
Sepals free; pollinia two.
Stem unbranched, roots fibrous, flowers in apical racemes . . . . . 70. *Aphyllorchis.*
Stem erect or scandent, often branched, flowers in terminal or lateral racemes or panicles . . . 71. *Galeola.*
Not saprophytic or parasitic, stems and leaves green.
Leaf solitary.
Leaf radical, usually not contemporaneous with the flowers; pollinia two or four . . . . . 72. *Pogonia.*
Leaf borne on the stem close to the flower and contemporaneous with it . . . . . 73. *Corysanthes.*
Leaves numerous, plicate; pollinia four, in pairs . . 74. *Cephalanthera.*
Anther dorsal; leaves numerous, plicate; pollinia four, in pairs . . . . 75. *Epipactis.*

65. Epipogum, Gmelin.

Terrestrial, leafless, brown-coloured herbs with tuberous or coralloid roots. *Stem* erect, sheathed. *Flowers* few, racemose. *Sepals* and *petals* sub-equal, free, narrowly oblong, erect or connivent. *Lip* adherent to the base of the column, ovate, entire or 3-lobed; the base broad and spurred; the disc with papillose ridges. *Column* short, with no foot. *Stigma* broad and prominent. *Anther* thickened, convex, 2-celled; *pollinia* two, broad, bifid, each attached to a short rudimentary caudicle; gland none. Two species, both Indian.

Spur as long as the lip and ovary; root branched . . . . . 1. *E. aphyllum.*
Spur much shorter than the lip and ovary, root a large tuber . 2. *E. nutans.*

1. Epipogum aphyllum, Swartz Sumn. Veg. Scand., 32.

Glabrous; height of the whole plant not exceeding 8 inches; root branching, coralloid. *Stem* stout, sometimes swollen at the base, with two unequal sheathing bracts, one near the base and the other higher up. *Raceme* 1·5 in. long and about 4-flowered. *Flowers* ·75 in. across from apex of dorsal sepal to apex of lip; *floral bract* membranous, oblong-elliptic, concave, longer than the slenderly stalked tumid ovary. *Sepals* and *petals* narrowly oblong, sub-acute. *Lip* large, 3-lobed; the side lobes large, rounded, erose at the apex; the apical lobe deflexed, ovate, acute, concave, its upper surface with three short and two long parallel caruncled ridges; the *spur* thick, blunt, dorsally flattened, as long as the lip and longer than the ovary.

Column stout, curved, the edges of the clinandrium lobulate. *Stigma* very large, occupying two-thirds of the anterior face of the column. *Anther* globose, with a semi-circular opening in front; *pollinia* broadly obovoid, compressed, their caudicles very slender. Boiss. Fl. Orient. V, 93; Reichb. Ic. Fl. Germ. XIII, t. 468; Hook. fil. Fl. Br. Ind. VI, 124. *E. Gmelinii*, Richard Orchid. Europ. Annot. 36; Lindl. Gen. and Spec. Orch. 383; in Journ. Linn. Soc. I, 176: Bot. Mag., t. 4821. *Satyrium Epipogium*, Linn. Syst. Veg. 676; Jacq. Fl. Austr., t. 84.

Sikkim, in the Lachen Valley, at an elevation of 12,000 feet; in flower during September; Pantling No. 418. Along the Himalayan range to Kashmir. Distrib.—Europe, N. Asia.

The whole plant is of a faint yellowish colour, except the lip which has red streaks on its spur and on the carunculate ridges of its upper surface.

PLATE 334.—*Epipogum aphyllum*, Swartz. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, *in profile*, 3 sepals and petals, separated, 4 apex of ovary, column with anther *in situ*, and stigma, 5 empty anther, 6 pollinia (swollen from immersion in fluid); *all enlarged*.

2. EPIPOGUM NUTANS, Reichb. fil. in Bonplandia for 1857, p. 36.

Glabrous; whole plant 4 to 16 in. high. *Stem* short or slender, proceeding from an oblong or fusiform under-ground tuber 2 in. or more in length; sheaths few, lax, scattered, broad, obtuse, ·5 or ·6 in. long. *Raceme* 2 to 8 in. long, with distant drooping flowers ·5 in. long (excluding the ovary); *floral bract* membranous, elliptic, acute, concave, shorter than the shortly-stalked ovary. *Sepals* and *petals* linear-oblong, acute, connivent. *Lip* elliptic, from a broad base, concave, entire, the apex with a short blunt apiculus, the upper surface with two (? sometimes three) parallel carunculate ridges; the *spur* short, slightly bulbous, less than half as long as either ovary or lip. *Column* short, *stigma* small. *Anther* large, sub-quadrate; *pollinia* two, each with two unequal lobes and attached below to a thin rather long caudicle. Lindl. in Journ. Linn. Soc. I, 177; Benth. Fl. Austral. VI, 308; Hook. fil. Fl. Br. Ind. VI, 124. *E. roseum*, Lindl. l. c. 177. *Galera nutans*, Blume Bijdr. 416, t. 3; Mus. Bot. Lugd. Bat. II, 187; Fl. Javæ, Orchid. 117, t. 52C. and 54E; Lindl. Gen. and Spec. Orch. 500. *G. rosea*, Blume Mus. Bot. Lugd. Bat. 188. *Podanthera pallida*, Wight Ic. t. 1759. *Ceratopsis rosea*, Lindl. Gen. and Spec. Orchid. 384. *Limodorum roseum*, Don Prod. 30.

Sikkim, in hot valleys, ascending to elevations of 4,000 feet; in flower from April to June; Pantling No. 147. Westward as far as Nepal, in similar situations. Khasia Hills; G. Mann. The Deccan, Ceylon. Distrib. Java, Australia, West Africa.

The stem and ovaries are of a very pale ochraceous yellow, the sheaths being brown. The flowers in the Sikkim plant are white, the lip having a few reddish-brown spots on its upper surface. Occasionally the flowers are spotted with pink. In expanded flowers, the pollinia rest directly on the stigma, and become absorbed in it as the plant gets old; only in the bud are the pollinia found lying within the anther.

PLATE 335.—*Epipogum nutans*, Reichb. fil. A plant, *of natural size* Fig. 1 floral bract and flower, *in profile*, 2 stalked ovary, column and lip, *in profile*, 3 the lip, 4 profile of the column, showing the anther (*a*), pollinia (*p*), stigma (*s*), column (*c*), and ovary (*o*), 5 front of column showing anther (*a*), two grooves in which the caudicles of the pollinia lie (*g*), pollinia (*p*), stigma (*s*), 6 pollinia; *all enlarged*.

66. Listera, R. Brown.

Terrestrial, erect, slender, 2-leaved herbs (leafless in one species), with fibrous roots. *Leaves* opposite or sub-opposite, rarely alternate, membranous, sessile or sub-sessile. *Flowers* small, racemose. *Sepals* and *petals* sub-equal, free, spreading or reflexed. *Lip* adnate to the base of the column, pendulous, longer than the sepals, narrow, the apex usually bifid, sometimes 3-fid or entire. *Column* stout, cylindric, usually curved forwards. *Anther* depressed, its lip obtuse; *pollinia* two or four cohering in pairs, rostellum short. Species about 16, natives of N. temperate regions and of high altitudes in the Himalaya.

The genus *Neottia* was founded by Linnæus in 1735 to include only *N. Corallorrhiza*. In his *Species Plantarum*, published in 1753, however, Linnæus omitted *Neottia* altogether; and his old *Neottia Corallorrhiza* appeared there in the genus *Ophrys*, into which also he put *O. nidus-avis*, *O. ovata*, and *O. cordata*, together with several others. *Corallorrhiza* (a name first used by Haller in 1742) was, within the chronological limits of binominal nomenclature, taken as a generic name by R. Brown, who in 1813, on page 209 of Aiton's *Hortus Kewensis* (Ed. II, Vol. 5), brought under it the *Ophrys Corallorrhiza* of Linnæus's binominal period. It is thus junior as a genus to the same author's *Listera*, which he first described on page 201 of the work just quoted. Two species which formed part of Linnæus's genus *Ophrys* of 1753 (viz., *O. ovata* and *O. cordata*) were put by Brown into the new genus *Listera* which, as has just been stated, he founded for their reception. *Listera* is, according to Kuntze, identical with *Diphryllum* of Rafinesque (published in 1808). In 1818, Richard (Mem. Museum Paris, 1818, Vol. 4, p. 58) resuscitated the generic name *Neottia*, and under it he put *N. nidus-avis*, *N. convallarioides*, and also *N. latifolia* (=*Listera ovata*, Br.) and *N. cordata* (=*Listera cordata*, Br.). The *Neottia* of Linnæus, dating as it does from 1735, and prior to its author's inauguration of the binominal nomenclature, and being moreover omitted in his *Species Plantarum* of 1753, falls entirely to the ground as a Linnæan genus. The reconstituted *Neottia* of Richard, dating only from 1818, is five years junior to the *Listera* of R. Brown (1813), and must give precedence to the latter. Amongst the plants attributed to the *Neottia* of Richard is *N. listeroides*, published by Lindley in Royle's Illustrations of Himalayan Botany in 1839, p. 368. The same plant was also figured by Decaisne in Jacquemont's Voyage (1840), p. 163, t. 163, as *Neottia Lindleyana*, Decne. In his Genera and Species of Orchids (p. 457) Lindley remarks that "with regard to the genera *Neottia*, Rich., and *Listera*, Brown, there is nothing that can be pointed out as a satisfactory distinctive mark, except their habit." In the opinion thus expressed we entirely agree, and we would suppress the *Neottia* of Richard. But according to the custom which makes priority the supreme consideration in changes of names, *Neottia listeroides* should, if transferred to *Listera*, become *Listera listeroides*. To avoid this absurdity we have therefore taken for the species Decaisne's more recent specific name (*Lindleyana*). The decision to use the name *Listera* for the conjoined genus may seem to some unsatisfactory, but no other course appears to us to be possible; for if, with Kuntze, one takes the Linnæan generic names prior to the establishment of the binominal nomenclature, then the name *Neottia* is applicable only to *Corallorhiza*. But if one begins with the publication of Linnæus's Species Plantarum in 1753, the name *Neottia* is of later date (1818) than the name *Listera* (1813) or than *Diphryllum* (1808)—the latter an altogether obscure and unfamiliar one which we decide to have nothing to do with.

Leafy—

The edges of the lip entire except at the apex.

Apex of lip 3-fid . . . . . 1. *L. micrantha.*

Apex of lip 2-fid.

Lip brown, the rest of the flower green.

Column short, straight . . . . . 2. *L. tenuis.*

Column long, much curved . . . . . 3. *L. pinetorum.*

Whole flower green.

Flowers ·6 in. long . . . . . 4. *L. longicaulis.*

Flowers ·25 in. long.
Leaves close to the root, opposite . . . . . 5. *L. brevicaulis.*
Leaves close to the raceme, sub-opposite or alternate . . . . . 6. *L. alternifolia.*
The whole margin of the lip dentate-pectinate . . . . . 7. *L. dentata.*
Leafless . . . . . 8. *L. Lindleyana.*

1. Listera micrantha, Lindl. in Journ. Linn. Soc. I, 176.

Whole plant 3 to 5 in. high, slender, erect, the stem below the leaves an inch or more long, glabrous and bearing a single oblong blunt short sheath. *Leaves* opposite, orbicular-ovate or cuneate-ovate, blunt or sub-acute, sessile, ·3 to ·5 in. long and nearly as broad. Peduncle twice as long as the stem, minutely puberulous; the *raceme* about half as long as the peduncle, sparsely 4- to 6-flowered. *Flowers* ·2 in. long; *bract* ovate, acute, concave, half as long as the pedicel of the ovary. *Sepals* and *petals* sub-equal, elliptic, sub-acute, spreading. *Lip* as long as the sepals, quadrate, decurved from the somewhat auriculate base; the apex with three acute unequal lobules, the middle much longer than the lateral, upper surface smooth. *Column* very short, straight. *Anther* depressed, its anterior edge truncate, rostellum very short. *Capsule* ovoid-globose. Hook. fil. Fl. Br. Ind. VI, 104; Ic. Plantar. t. 2171.

Sikkim, Lachen and Lachoong Valleys, at elevations of 10,000 to 11,000 feet; in flower during July; Hooker, Pantling No. 377.

The flowers are of rather a pale green, the column alone being whitish.

Plate 336.—*Listera micrantha*, Lindl. A plant, *of natural size.* Fig. 1 front view of a flower, 2 floral bract, ovary, column with anther *in situ*, and lip, 3 lip, 4 column with anther *in situ*, *front view*, 5 anther, 6 pollinia; *all enlarged.*

2. Listera tenuis, Lindl. in Journ. Linn. Soc. I, 176.

Whole plant 4 to 6 in. high, the stem bearing a wide loose sheath about half way between the root and the leaves. *Leaves* elliptic-ovate, acute, inserted nearer the raceme than the root, sessile, ·5 to ·75 in. long. *Raceme* glandular-puberulous, 4- to 8-flowered, about as long as the peduncle. *Flowers* ·25 in. long; *floral bract* membranous, narrowly ovate, sub-acute, shorter than the stalked ovary. *Sepals* and *petals* sub-equal, oblong, sub-acute, connivent, the lateral sepals sometimes acute. *Lip* longer than the sepals and petals, cuneately obcordate, the lobules of the apex rounded, the sinus somewhat blunt, the upper surface flat with a central dark line, the base with a small pit. *Column* slightly curved, short, rostellum obtuse. *Anther* papillose, its anterior edge obtuse. Hook. fil. Fl. Br. Ind. VI, 104; Ic. Plantar. t. 2169.

Sikkim, in the Lachen Valley. Bhotan, in the Chumbi Valley; at elevations of 11,000 to 12,000 feet; in flower during July; Hooker, Pantling No. 378.

The sepals and petals are of a pale olivaceous green, the lip being pale brown with a dark midrib and faint oblique lines proceeding from it to the edges.

Plate 337.—*Listera tenuis*, Lindl. A plant, *of natural size.* Fig. 1 bract, ovary and flower, *side view*, 2 lip, upper surface, 3 apex of ovary, column with anther *in situ*, the pollinia having been removed, 4 anther, 5 pollinia; *all enlarged.*

3. Listera pinetorum, Lindl. in Journ. Linn. Soc. I, 175.

Slender, erect, whole height 4 to 8 in., of which three-fourths are stem below the leaves. The *stem* naked. *Leaves* very broadly cordate or reniform, acute, sessile, from ·5 to 1 in. long and about equally broad. Peduncle about ·5 in. long, covered with coarse glandular hairs; *raceme* 2- to 10-flowered, puberulous. *Flowers* ·35 to ·5 in. long; *floral bract* ovate-lanceolate, acuminate, herbaceous, convolute, shorter than the pedicelled ovary. *Sepals* sub-equal, spreading, ovate-oblong, sub-acute. *Petals* somewhat shorter than the sepals, linear oblong, sub-acute. *Lip* much longer than the sepals, obovate-oblong, narrowed to the base, flat, the apex divided into two blunt slightly oblique lobules by a narrow blunt sinus with almost parallel sides; the upper surface with two small erect triangular calli near the base whence runs a broad raised dark line throughout its entire length. *Column* rather long, cylindric, much curved forwards; rostellum and *anther* blunt, *pollinia* clavate. Hook. fil. Fl. Br. Ind. V, 104; Ic. Plantar. t. 2170.

Sikkim, in the Lachen Valley, Hooker. Bhotan, in the Chumbi Valley; King's Collector; at elevations of from 10,000 to 11,000 feet; in flower during July; Pantling No. 376.

The sepals and petals are of rather pale olivaceous green, slightly flushed with brown; the lip is pale brown with a broad dark band along the central ridge; the column is warm reddish-brown below, but green near the summit.

Plate 338.—*Listera pinetorum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column with anther and lip, *side view*, 3 apex of ovary, column with anther and pollinia *in situ*, 4 anther, 5 pollinia; *all enlarged*.

4. Listera longicaulis, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 126.

Length of the whole plant 6 to 14 in., of which half is the raceme and its peduncle. *Stem* rather stout, glabrous. *Leaves* at the apex of the stem, orbicular-ovate to reniform, sub-acute or blunt, from 1·25 to 1·5 in. long and about as broad. *Raceme* longer than the peduncle, puberulous, with 8 to 14 distant flowers ·6 in. long. *Ovary* with its pedicel ·4 in. long; *floral bract* lanceolate, about as long as the slender pedicel. Dorsal *sepal* ovate-lanceolate, erect; lateral sepals and petals linear-lanceolate, sub-falcate, all slightly reflexed. *Lip* large, three times as long as the lateral sepals, flat, ovate-elliptic, the apex blunt and rather deeply bifid, the margins minutely ciliolate, the upper surface with a thickened mesial line from base to apex from which diverge glandular-pubescent branching nerves. *Column* rather long, sharply curved at the apex.

Lachen Valley, elevation about 7,000 feet; in flower in July; Pantling No. 391.

A species resembling *L. japonica*, Bl., which however is a smaller, more slender plant, with a much more deeply bifid lip.

The flowers are of a nearly uniform green colour, veined with a darker shade of the same.

Plate 339.—*Liparis longicaulis*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, *front view*, 2 a flower, *side view*, 3 lower surface of anther, 4 pollinia; *all enlarged*.

5. LISTERA BREVICAULIS, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 126.

Whole plant 6 to 9 in. high; the rather stout *stem* bearing, quite close to the ground, a pair of unequal ovate-rotund acute leaves ·8 to 1 in. long; the peduncle of the inflorescence as long as the raceme, sparsely puberulous and bearing two distant linear-lanceolate bracts ·5 in. long. *Raceme* 3 to 4 in. long, puberulous, with 12 to 16 scattered flowers ·25 in. long; *floral bract* ovate-lanceolate, acute, longer than the pedicel of the ovary. *Sepals* and *petals* sub-equal, shorter than the lip, lanceolate, acute, sub-connivent. *Lip* fleshy, obcordate and with a thickened mesial line throughout its entire length; the apical lobes divergent, broad and blunt, their edges recurved and meeting underneath, the sinus wide, the base much narrowed and with two conical forward-pointing teeth at its junction with the short curved column.

Sikkim, in the Lachen Valley; elevation 9,000 feet; flowering in July; Pantling No. 392.

The flowers are of a dull olivaceous green throughout, the central ridge of the lip alone being brown.

PLATE 340.—*Listera brevicaulis*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, *in profile*, 2 bract, ovary, column with anther *in situ* and lip, *side view*, 3 lip, spread out, 4 lower surface of anther; *all enlarged*.

6. LISTERA ALTERNIFOLIA, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 126.

Height of entire plant 8 to 10 in. *Stem* glabrous, 4 to 6 in. long, sheathed at the base by a blunt oblanceolate bract nearly 2 in. long, and bearing near its apex two alternate or sub-opposite, more or less obovate or elliptic leaves ·5 to ·6 in. long. Peduncle puberulous; *raceme* bearing seven to nine distant nodding olive-green flowers nearly ·25 in. across; *floral bract* lanceolate, about as long as the slender pedicel of the ovary. *Sepals* lanceolate, spreading, sub-acute. *Petals* narrowly oblong, blunt. *Lip* rather longer than the sepals, oblanceolate-oblong, with a thickened central line from base to apex, the apex blunt and shortly 2-lobed, the sinus short, the margins ciliolate, the base broad and with a wart-like callus at each side. *Column* short, stout, curved. *Anther* depressed, blunt.

Sikkim, Lachen Valley, elevation about 10,000 feet; in flower in July; Pantling No. 390.

A species of which the leaves are usually alternate, whereas in all other species of the genus they are invariably opposite.

The flowers are of a nearly uniform green colour.

PLATE 341.—*Listera alternifolia*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column with anther *in situ* and lip, *side view*, 3 lip, 4 column with anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

7. LISTERA DENTATA, *new species*.

Whole plant 8 to 12 in. high; the *stem* forming three-fourths of the whole, glabrous, and bearing near its base two unequal sheaths ·5 to 1·5 in. long. *Leaves*

two, opposite, at the very apex of the stem and at the base of the peduncle, orbicular-cordate, acute, 1 to 1·5 in. long and about the same in breadth. Peduncle about ·5 in. long, pubescent. *Raceme* 3 to 4 in. long, many-flowered, its rachis pubescent. *Flowers* ·25 in. across; *floral bract* ovate-lanceolate, acute, concave, equalling or exceeding in length the pedicelled ovary. *Sepals* sub-equal, ovate, acute, the dorsal recurved, the lateral pair spreading. *Petals* elliptic-oblong, sub-acute, recurved. *Lip* fleshy, clawed, reniform in outline, its edges dentate-pectinate, the disc with a thickened mesial line from base to apex, (becoming thicker near the apex), the claw with two antrorse teeth. *Column* short, stout, the *rostellum* blunt. *Anther* very fleshy; *pollinia* two, pyriform, with a small abortive pair on the under surface.

Sikkim, at Jongri, elevation 13,000 feet; in flower during July; Pantling No. 452.

The flowers are green in colour throughout.

Plate 342.—*Listera dentata*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther *in situ* and lip, seen from the side, 3 column showing anther, rostellum and stigma, 4 anther, 5 and 6 the pollinia, seen from the front and the back; *all enlarged*.

2. Listera Lindleyana, King and Pantling.

Whole plant 8 to 14 in. high, stout or slender. *Stem* slightly longer than the raceme and bearing three or four loose convolute rather blunt sheaths about 1 in. long; sub-glabrous in its lower, glandular-pubescent in its upper part like the raceme. *Flowers* from ·3 to ·5 in. long, lax; *floral bract* oblong, as long as or longer than the pubescent stalked ovary. *Sepals* elliptic-ovate, somewhat falcate, concave, sub-acute. *Petals* much smaller, linear, blunt. *Lip* two or three times as long as the sepals, narrowly oblong; the apex deeply cleft into two oblong, lanceolate, acute lobules; the sinus broad, with a small triangular process at its apex; upper surface minutely puberulous, the midrib thickened. *Column* much curved, expanded at base and apex. *Capsule* turgid, ridged, ·3 in. long, its pedicel about as long. *Neottia listeroides*, Lindl. in Royle Ill. Him. Bot., p. 368; Gen. and Spec. Orch., 458; in Journ. Linn. Soc. I, 176; Hook. fil. Fl. Br. Ind. VI, 103. *N. Lindleyana*, Decne. in Jacquem. Voy. Bot., p. 163, t. 163.

Sikkim, in the Lachen Valley; elevation 10,000 feet; Pantling No. 393; in flower during July. Westward along the range to Kashmir, at elevations of from 5,000 to 10,000 feet.

The flowers are probably of a reddish-brown colour when fresh. The specimens from which the drawing was made were not quite fresh, and we are doubtful about the colour of their flowers being normal.

Plate 343.—*Listera Lindleyana*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column with anther *in situ*, and lip, 3 lip, 4 anther; *all enlarged*.

67. Pantlingia, Prain.

A small terrestrial saprophytic aphyllous rhizomatous herb. *Stems* 3 to 4 in. high, each with a small solitary ovate bract about its middle. *Flowers* minute, few, racemose. *Sepals* sub-equal, free, narrow. *Petals* linear. *Lip* adnate to the base of the column, transversely elliptic, slightly concave, entire; the upper surface with two elongated parallel calli extending from the base to about the middle. *Column* slightly curved forwards, with

an acute auricle on each side of the anther, otherwise wingless; its anterior surface bearing about the middle a short transverse horizontal sub-truncate emarginate plate and, at its base just above the insertion of the lip, a sub-erect, rigid, transversely and unequally 2-lobed fleshy tongue-like process half as long as itself. *Anther* opening vertically; *pollinia* four, in two pairs, confluent by their bases with the narrow strap-shaped rostellum, without either caudicle or gland. A single species, Indian.

PANTLINGIA PARADOXA, Prain in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 107.

Rhizome short, about half as thick as a goose-quill, pubescent. *Stems* 1 or 2, from 3 to 4 in. long, pubescent near the base, otherwise glabrous, bearing about the middle a single ovate acute bract ·25 in. long. *Flowers* 2 or 3, racemose, ·15 in., or (with the ovaries) ·4-·6 in. long; *floral bract* ovate, acute, about as long as the slender pedicel. Lateral *sepals* linear, lying under and adpressed to the lip; the dorsal longer than the lateral, linear-oblong, slightly shorter than and adpressed to the column. *Petals* linear, reflexed or spreading. *Lip* with the margins somewhat incurved. *Anther* with a vertical suture; *pollinia* in two pairs, confluent by their bases with the narrow strap-shaped rostellum.

Sikkim Himalaya, at Choongtong; elevation 6,000 feet; in flower during September; Pantling No. 420.

The pollen masses are attached by their bases to the strap-shaped rostellum, which is not detachable from the top of the stigma. They appear to fertilize the latter by the gradual absorption and disappearance of the rostellum. The nearest alliance of the genus is with *Limodorum*, some of the species of which have small processes on the column in the situation of those that are so highly developed in this singular plant; the lip in *Limodorum* is, however, altogether different.

The colour of the flowers is pale yellow, with a purple blotch on the lip and on the bifid tongue at the base of the column.

PLATE 344.—*Pantlingia paradoxa*, Prain. Two plants, *of natural size*. Fig. 1 a flower, 2 bract, ovary and flower, *viewed from the side*, 3 the lip flattened out, 4 the column, showing the anther and the auricles by the side of it, the transverse plate proceeding from the front of the column, and the 2-lobed obliquely pointed fleshy process at its base, 5 pollinia; *all enlarged*.

68. Gastrodia, R. Brown.

Terrestrial leafless herbs of a brown colour with rhizomes and elongated roots. *Stem* erect, sheathed. *Flowers* in a lax raceme. *Sepals* connate into a ventricose tube 3-toothed at the apex. *Petals* minute, inserted close to two of the sinuses of the mouth of the sepaline tube. *Lip* short, adnate to the foot of the column, oblong, entire, clawed at the base, the claw often bearing calli. *Column* usually long, narrowly winged, the foot short; rostellum small, stigma large. *Anther* terminal, convex; *pollinia* two, sub-clavate, without caudicle or gland. Species nine, Asiatic and Australasian.

GASTRODIA DYERIANA, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, pt. 2, 342.

Rhizome short, twice as thick as the stem, horizontal, with slender spreading roots. *Stem* about the thickness of a crow-quill, 12 to 15 in. long, bearing, at intervals, sheathing

bracts ·5 in. long. *Flowers* three or four near the apex of the stem, ·5 or ·6 in. long, brownish, nodding. *Sepaline tube* cylindric, glabrous, the mouth 3-lobed. *Petals* minute, sub-rotund, entire, inserted on the sepaline tube near the bases of two of its sinuses. *Lip* as long as the column but shorter than the sepaline tube, ovate-lanceolate, clawed, flat, with undulate-crenate edges and with four parallel thickened lines from the base to nearly the tip; claw short, and bearing two sub-globular calli. *Column* with winged sides, the apex truncate and 4-toothed; *pollinia* narrowly and obliquely ovoid.

Sikkim, at elevations of about 7,000 feet; flowering in August; Pantling No. 293.

The whole plant is of a pale dull brown colour, except the column and lip which are yellowish-white. The species is allied to *G. exilis*, Hook. fil., but that species has smaller flowers with fimbriate (or glandular) lateral petals and a lip with two long wing-like central lamellæ. It is less closely allied to *G. orobanchoides*, Benth, which has erect flowers and a ventricose sepaline tube. It agrees with *G. elata*, Blume, in having two callosities on the claw of the lip. We have dedicated the species to Mr. W. T. Thiselton Dyer, F.R.S., C.M.G., C.I.E., Director of the Royal Gardens, Kew.

PLATE 345.—*Gastrodia Dyeriana*, King and Pantling. Two plants, *of natural size*. Fig. 2 a flower, 1 section of the same, showing the minute petals within the sinus of the sepaline tube, 3 the lip showing the callosities on its claw, 4 apex of ovary, column and lip, *side view*, 5 column with the anther *in situ*, 6 anther, 7 pollinia; *all enlarged*.

69. Didymoplexis, Griff.

Terrestrial aphyllous herbs with tuber-like roots. *Scape* simple, bearing a scanty raceme of small flowers, the pedicels elongating in fruit. *Sepals* and *petals* cohering by their margins into a short tube, their apices alone free, the dorsal sepal and petals forming the upper 3-lobed lip, the lateral sepals forming the lower entire or bifid lip. *Lip* shorter than the perianth-tube, inserted on the very short foot of the column, rather broad, its disc studded with numerous minute calli. *Column* long, nearly straight, narrowly winged in the upper part and 3-toothed at the apex. *Stigma* broad. *Anther* 2-celled, depressed; *pollinia* 4, unequal, in pairs. *Capsules* elliptic, tumid, ridged, their pedicels accrescent and often reaching a length of six inches. Two species, one Indo-Malayan, the other Australasian.

DIDYMOPLEXIS PALLENS, Griff. in Calc. Journ. Nat. Hist. IV, 383, t. 17.

Root long, branching, moniliformly tuberous. *Stem* erect, 3 to 6 in. long, with one or two blunt sheaths about ·2 in. long. *Raceme* 4- to 8-flowered. *Flowers* about ·35 in. long; *floral bract* triangular, much shorter than the gradually lengthening pedicel of the ovary; pedicel and ovary at first about ·2 or ·25 in. long, the former lengthening with the ripening of the fruit to as much as 6 inches. Dorsal *sepal* ovate, obtuse, concave; the lateral pair united to the middle, their free portions obtuse. *Lip* with a short curved claw, cuneately oblong, the apex truncate and minutely erose; the disc bearing an oblong thickening, studded, especially towards the base and apex, with minute granulations. *Column* nearly straight, winged in its upper third, the apex with three teeth; produced below into a very short foot, forming with the lateral sepals a short mentum. *Pollen grains* closely adherent to each other. *Capsule* ·75 to 1 in. long, tumid. Kurz in Seem. Journ. Bot. 1866, 40 (*excl. syn.*

Epiphanes and *Gastrodia*); Hemsl. in Journ. Linn. Soc. XX, 311, t. 28; Hook. fil. Fl. Br. India, VI, 121. *Leucorchis sylvatica*, Blume Mus. Bot. Lugd. Bat. I, 31; Floræ Javæ, Och. 123 (*with wood-cut*). *Apetalon minutum*, Wight Ic. t. 1758; Blume l. c. 124 (*with wood-cut*). *Arethusa ecristata*, Griff. Notul., III, 378; Ic. Plant. Asiat, t. 343, 344. *A. bengalensis*, Hort. Bot. Calc.

Sikkim, in the bottoms of tropical valleys, usually under clumps of bamboo and evidently parasitic on their roots; in flower during May and June; Pantling No. 146. Distributed over the whole of Bengal and Assam from the base of the Sikkim Himalaya to the Bay of Bengal; also in Southern India and Perak.

The colour of the whole plant is ochraceous white, the flowers being tinged with warm brown. The growth of the flower-pedicel after fertilization of the ovary is very remarkable.

PLATE 346.—*Didymoplexis pallens*, Griff. Plants in flower and fruit, *of natural size*. Fig. 1 a flower, 2 pedicel, ovary and flower, *seen from the side*, 3 apex of ovary, column and lip, *in profile*, 4 floral bract and part of pedicel, 5 the lip, *spread out*, 6 apex of ovary and column with anther *in situ*, 7 apex of column after removal of the anther, showing the three apical teeth, 8 anther, 9 pollinia; *all enlarged*.

70. Aphyllorchis, Blume.

Terrestrial leafless herbs with rhizomes and thick roots. *Stem* simple, sheathed. *Flowers* racemose, brown in colour. *Sepals* sub-equal, free, erect or spreading. *Petals* smaller than the sepals. *Lip* sessile on the base of the column or attached to it by a short claw, as long as the sepals, oblong, sometimes auricled at the base, entire or 3-lobed. *Column* usually rather long, wingless. *Stigma* anticous, concave, ovate or oblong. *Anther* shortly stipitate, its cells contiguous; *pollinia* oblong or clavate. Species about five, Indian and Malayan.

Floral bract much longer than the ovary, strongly reflexed . . . . *1. P. alpina.*

Floral bract shorter than the ovary, not reflexed.

Flowers ·15 in. long . . . . . *2. P. parviflora.*

Flowers ·75 in. long . . . . . *3. P. montana.*

1. APHYLLORCHIS ALPINA, *new species*.

Height of the whole plant 18 to 30 inches. *Rhizome* elongate, loosely clothed with small imbricating polished scales. *Stem* nearly as thick as the little finger, bearing numerous unequal tubular blunt sheaths ·5 to 2·5 in. long. *Raceme* 8 to 12 in. long. *Flowers* ·75 to 1 in. across, numerous, distant; the ovary and its slender stalk about 1·25 in. long; *floral bract* large, linear, acuminate, much deflexed, 1 to 1·25 in. long. *Sepals* sub-equal, lanceolate, acuminate, concave, spreading. *Petals* smaller than the sepals, ovate-lanceolate, the midrib thickened on the outer surface. *Lip* shorter than the petals, clawed; the claw winged, adnate to the sides of the column and forming with them a small pouch; the basal half with erect rounded sides; the apical half ovate, acute, with involute margins and an elliptic convexity near the apex. *Column* stout, curved, striate on its anterior surface; the

stigma with an overlapping irregularly-lobulate edging. *Anther* 2-celled; *pollinia* cohering in two pairs, mealy.

Sikkim, at Sin-ga-le-la and Mon Lepcha; elevation about 14,000 feet; Pantling No. 462, in flower during July and August; King's Collector No. 4459.

The flowers of this, the largest species of the genus yet obtained in India, are yellowish-red in colour. The specific name is given on account of the very high elevations at which the plant grows. A specimen of it collected in 1877 (King's Collector No. 4459) was sent to the late Professor Reichenbach, who, however, never described it. When his great Herbarium shall be exhumed after its twenty-five years sepulture in Vienna, this plant will probably be found to bear a Reichenbachian manuscript name.

PLATE 347.—*Aphyllorchis alpina*, King and Pantling. Rhizome, part of the stem, and the inflorescence of a plant; *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column with anther *in situ*, and lip, 3 lip, 4 column showing the sac at its base formed with the claw of the lip, the stigma with its lobulate margin, and the anther, 5 empty anther; *all enlarged*.

2. APHYLLORCHIS PARVIFLORA, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 128.

Height of entire plant about 10 inches, glabrous. *Rhizome* short, with many fibrous fascicled rootlets. *Stem* erect, about ·1 in. thick, leafless, but with four or five sheathing bracts ·5 to 2·5 in. long. *Racemes* about 2 in. long, many-flowered, the rachis stout. *Flowers* ·15 in. across, the labellum superior; *floral bract* lanceolate, shorter than the straight untwisted tumid ovary. *Sepals* sub-equal, linear, acuminate, spreading, their apices recurved; *petals* similar but smaller, all keeled externally. *Lip* ovate, the base broad, obscurely lobed, sub-acute, concave. *Column* very short, rostellum prominent; *anther* with reflexed margins. *Pollinia* two, clavate, the grains loosely cohering.

Sikkim in the Lachoong Valley, at an elevation of 10,000 feet; flowering time July; Pantling No. 383.

The ovary of this not having the usual half-twist, the labellum is superior. The whole plant is of a pale brown colour, except the anther which is white, and the pollinia which are yellow.

PLATE 348.—*Aphyllorchis parviflora*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column and lip, showing the anther (*a*), the pollinia (*p*) and the rostellum (*r*), *seen from the side*, 3 lip, 4 apex of ovary, column with anther *in situ*, 5 inside view of an anther, the margins being reflexed, 6 pollinia; *all enlarged*.

3. APHYLLORCHIS MONTANA, Reichb. fil. in Linnæa XLI, 57.

Stem about 24 in. high, glabrous near the base and bearing 6 to 10 unequal short blunt tubular sheaths; pubescent in the upper part and bearing a few distant ovate-lanceolate acute sheaths not tubular at the base. *Racemes* 4 to 6 in. long, bearing 8 to 14 distant flowers about ·75 in. across; the ovary ·75 to 1 in. long, its stalk very short and twisted; the *floral bract* linear, spreading, about ·5 in. long. *Sepals* sub-equal, oblong, blunt; the dorsal concave, overhanging the column; the lateral pair curved, spreading, sub-acute. *Petals* slightly longer than the sepals, oblong, blunt, spreading. *Lip* somewhat longer than the sepals, ovate oblong, shortly clawed at the

base; the side lobes broad, rounded; the apical lobe broadly oblong, sub-undulate, the edges minutely erose, the whole of the upper surface minutely carunculate. *Column* slender, much curved forwards, the apex not thickened. *Anther* erect; *pollinia* four, oblong, united in pairs. Hook. fil. Fl. Br. Ind. VI, 116. *Apaturia montana*, Thwaites Enum. Pl. Ceyl. 301 (*not of Lindl.*).

Sikkim, at Guru Bathan; elevation 2,000 feet; Griffith; Pantling No 344; in flower during August. ? Khasia Hills. Ceylon; Thwaites.

The whole plant is of a pale brown colour, the only exception being the pollinia which are yellow. The roots are very thick.

PLATE 349.—*Aphyllorchis montana*, Reichb. fil. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther *in situ*, and lip, *in profile*, 3 lip, 4 column showing the stigma, pollinia (*p*) and cap of the anther, 6 pollinia; *all enlarged*.

71. Galeola, Lour.

Leafless, yellow or brown, climbing or erect herbs. *Flowers* rather large, in racemes or panicles on the ends of the branches and stem. *Sepals* sub-equal, concave, free, connivent or spreading. *Petals* as large as the sepals, or narrower or broader. *Lip* adnate to the base of the column and convolute round it, broad, concave, with or without lateral lobes; apical lobe large, broad. *Column* dilated towards the apex. *Anther* conical, 2-celled; *pollinia* two, broad, often compressed, powdery. Species 12; Indian, Malayan and Australian.

Stems scandent; flowers not exceeding 1 in. in diam.
- All the sepals linear-oblong, lip cuneate at the base . . . . . 1. *G. Cathcartii.*
- Dorsal sepal oblong; the lateral pair obliquely ovate, sub-falcate, acute; lip cordate at the base . . . . . 2. *G. Hydra.*

Stems erect, not scandent; flowers 1·5 in. or more in diam.
- Flowers 1·5 in. in diam., anther papillose; capsule sub-trigonous, 6 or 7 in. long; rhizome 1 in. thick . . . . . 3. *G. Lindleyana.*
- Flowers 2 in. in diam., anther smooth; capsule sharply 3-angled, falcate, 9 in. long; rhizome 1·5 to 2·5 in. thick. . . . . 4. *G. Falconeri.*

1. GALEOLA CATHCARTII, Hook. fil. Fl. Br. Ind. VI, 89.

Stem scandent, smooth, scurfy, branching and bearing roots at intervals, 20 to 30 feet in length and ·5 in. in thickness, rising from a rhizome ·5 to ·75 in. thick. *Panicles* 3 to 6 in. long, lateral, spreading or drooping, pubescent, sheathed at the base by one or two broad oblong blunt glabrous coriaceous bracts. *Flowers* (exclusive of the ovary) ·75 to ·90 in. long; *floral bract* minute, triangular, much shorter than the pubescent sub-cylindric ovary. *Sepals* linear-oblong, sub-acute, recurved, furfuraceous outside. *Petals* of the same shape but smaller than the sepals, both recurved. *Lip* shorter than the petals, obovate (when spread out), very concave, entire in its basal third, erose-laciniate in its upper two-thirds, its upper surface papillose and with a small oblong callus near the rounded apex. *Column* half as long as the lip, bent forwards from the middle; the clinandrium with dentate margins. *Anther* fleshy, conical, its apex directed backwards; *pollinia* mealy, broadly and obliquely elliptic. *Capsule* cylindric, furfuraceous, probably 6 or 8 in. long when ripe.

Sikkim, in the valley of the Rungeet, at an elevation of 1,500 feet; in flower in June; Pantling No. 318; (*only once collected*).

The flowers are yellow, the lip having red lines in its basal half.

PLATE 350.—*Galeola Cathcartii*, Hook. fil. Parts of a plant. Fig. 1 the sepals and petals, separated and flattened out, *of natural size*. Fig. 2 a flower, 3 floral bract, ovary, column and lip, *seen from the side*, 4 the lip flattened out, 5 apex of ovary, column with anther *in situ*, 6 anther so as to show its interior, 7 pollinia; *all enlarged*.

2. GALEOLA HYDRA, Reichb. fil. Xen. Orch. II, 77.

An extensive climber with stout root-bearing furfuraceously puberulous branches; bracts few, scattered, fleshy, ovate, cymbiform, unequal, those on the flowering branches very small. *Racemes* 2 to 4 inches long, laxly-flowered. *Flowers* 1 in. in diam.; *floral bract* fleshy, pointed, much shorter than the stalked ovary. *Sepals* sub-equal in length; the dorsal oblong, sub-acute; the lateral pair obliquely ovate, sub-falcate, acute. *Petals* somewhat shorter than the sepals, the lower edge rounded; the upper undulate, rather straight. *Lip* sub-orbicular, very concave, cordate at the base; the edges erose-fimbriate, not lobed; the upper surface papillose-pubescent, the disc with a smooth elongate callus towards the base. *Column* much curved. *Anther* irregularly ribbed; *pollinia* broad, bifid, excavated. *Capsule* cylindric, 8 or 9 in. long. Hook. fil. Fl. Br. Ind. V, 89. *G. altissima?* Reichb. fil. in Trans. Linn. Soc. XXX, 135. *Vanilla pterosperma*, Lindl. in Wall. Cat. 7402. *?V. rubiginosa*, Griff. Notul. III, 247. *Erythrorchis altissima*, Lindl. Gen. and Spec. Orch., 438 (*in part, not of Blume*).

Sikkim, in the Rishap Valley, climbing on tall trees; King, Pantling No. 321; in flower during July. Tenasserim, Penang, Perak, Singapore, Malacca, Java and Sumatra.

The colour of the flowers is yellow, with red markings at the base of the lip and on the anther.

PLATE 351.—*Galeola Hydra*, Reichb. fil. Parts of a flowering plant, and fig. 1 the sepals and petals, *of natural size*. Fig. 2 stalked ovary and lip, *seen from the side*, 3 base of the lip, showing the callus on the disc, 4 apex of the ovary, column, anther and stigma, 5 anther, 6 pollinia; *all enlarged;* 7 piece of the base of the stem and rhizome, 8 a mature capsule; *of natural size*.

3. GALEOLA LINDLEYANA, Reichb. fil. Xen. Orchid. II, 78.

Rhizome an inch thick, reddish, clothed in large cordate fleshy scales. *Stems* 4 or 5 feet high, bearing numerous short acute sheaths in the lower half, furfuraceous like the panicles and ovaries. *Panicles* with short, lax, few-flowered, drooping branches. *Flowers* sub-globose, thick and somewhat spongy in texture, 1·5 in. across; *bract* ovate, sessile, withered when the flowers expand, shorter than the short stalk of the cylindric ovary. *Sepals* sub-equal, the dorsal elliptic oblong, the lateral pair wider, all with strong, toothed, wavy ribs externally. *Petals* broadly ovate, blunt, longer than the sepals, the margins ciliate. *Lip* cup-shaped with a very narrow obscurely 3-lobed border; the whole upper surface papillose, but bearing at the base, just below the column, a small smooth glabrous chamber; the disc lamellate, the margins ciliolate. *Column* clavate, slightly curved forwards and bearing two erect granular processes near its base. *Anther* boldly papillose, curved backwards. *Pollinia* two, free, compressed, each cleft at the base. *Capsule* oblong,

obtusely sub-trigonous, bluntly apiculate, narrowed slightly at the base, 6 or 7 in. long and about 1·25 in. in diam., tardily dehiscent. Hook. fil. Fl. Br. Ind. VI, 88. *Cyrtosia Lindleyana*, Hook. fil. and Thoms. in Ill. Him. Plants, t. 22. *Erythrorchis Lindleyana*, Reichb. fil. in Bonplandia, V, 37.

Sikkim, at elevations of 5,000 to 7,000 feet; Hooker and other collectors; Pantling No. 88. ? Khasia Hills, at an elevation of 4,000 feet; Hooker and Thomson. Naga Hills; Prain.

This is one of the most striking orchids in Sikkim. The stems are brownish-purple in colour, becoming paler and yellowish upwards. The flowers are bright yellow throughout, with a reddish patch on the lip at each side of the column. The anther is coloured crimson-lake.

PLATE 352.—*Galeola Lindleyana*, Reichb. fil. A panicle. Fig. 1 a ripe capsule—*both of natural size*, 2 bract, sub-sessile ovary and lip, 3 vertical section of the lip, showing the chamber at its base, 4 column, showing its basal processes and the anther *in situ*, 5 lower surface of anther, 6 pollinia; *all enlarged*.

4. GALEOLA FALCONERI, Hook. fil. Fl. Br. Ind., VI, 88.

Rhizome 1·5 to 2·5 in. thick, branching, clothed with large fleshy triangular scales. *Stems* 6 to 10 feet in height and about one inch in thickness at the base, bearing at intervals lanceolate to triangular acute bracts one to two inches in length. *Panicle* 2 to 3 feet long, its branches 3 to 9 in. long, drooping, lax. *Flowers* of a spongy texture; *bract* lanceolate, concave, ·5 in. long, shorter than the short stalk of the ovary. *Ovary* 1·5 to 2 in. long. *Sepals* sub-equal, broadly ovate, sub-acute, sparsely furfuraceous like the ovary. *Petals* ovate, acute, the edges crose. *Lip* sessile, without side lobes, deeply concave, the base with a small fold forming a pseudo-nectary under the column, the apex rounded, the margins undulate-ciliolate; the upper surface papillose but with a broad glabrous patch in the middle. *Column* stout, slightly clavate and somewhat bent forward. *Anther* fleshy, glabrous, its lip entire. *Pollinia* two, much compressed, thin, oblique in outline. *Capsule* oblong, 3-angled, sub-falcate, 9 in. long, sub-furfuraceous. *Pogochilus sp.*, Falc. in Hook. Journ. Bot. (1842), 73.

Sikkim, at elevations of 5,000 to 7,000 feet; Thomson, Pantling No. 87; not now common. Westward along the range to Gharwal; in flower during July and August.

The flowers of this are of a bright yellow colour and have an odour of *vanille*. The ripe capsules are pale brown. This closely resembles *G. Lindleyana*, of which Sir Joseph Hooker suggests that it may be a variety; but it has larger flowers than that plant; also larger, less furfuraceous and much more sharply-angled sub-falcate capsules. The rhizome also is very much stouter.

PLATE 353.—*Galeola Falconeri*, Hook. fil. Parts of a plant. Fig. 1 front view of a flower, 2 bract, stalked ovary and lip, *side view*, 8 a capsule, *of natural size;* 3 portion of upper surface of lip, showing the pseudo-nectary, 4 vertical section of lip, also showing the pseudo-nectary, 5 column with the anther *in situ*, 6 lower surface of anther, 7 pollinia; *all enlarged*.

72. Pogonia, Juss.

Terrestrial 1-leaved herbs; the flower scapes from the same tuber as the leaf and appearing before it (contemporaneous in some species); tuber emitting, just below the

surface of the ground, two or three runners, each producing at its extremity a tuber smaller than that of the parent. *Leaf* broadly cordate or orbicular, strongly plicate. *Flowers* solitary, few or in racemes, often pendulous. *Sepals* and *petals* sub-equal, narrow, connivent or spreading. *Lip* sometimes slightly saccate at the base, adnate to the base of the column, rather narrow, the lower part convolute round the column; the lateral lobes small, usually triangular; the apical lobe flat, ovate or orbicular, entire or fimbriate. *Column* elongate, clavate upwards; the *stigma* anticous, oblong to orbicular. *Pollinia* two or four, elongate, often cohering together, but without either caudicle or gland. Species about 70, Asiatic and American, with a few West Indian.

The Indian species, with the exception of *P. Hookeriana* and of a new species recently discovered in Burma, belong to the section *Nervilia*, in which the leaf and flowers are not contemporaneous. The species with contemporaneous leaf and flowers are mostly natives of America, only one being Japanese, and two Indian.

Sect. I, *Eu-Pogonia*.—Leaf and flowers contemporaneous and from the same tuber . . . . . *1. P. Hookeriana.*

Sect. II, *Nervilia*.—Leaf appearing after the flowers and produced by a different tuber.

Flower solitary.

Anterior lobe of lip fimbriate . . . . . *2. P. Prainiana.*

Anterior lobe of lip not fimbriate.

Flower 1 in. long . . . . . *3. P. macroglossa.*

Flower ·4 to ·6 in. long . . . . . *4. P. falcata.*

Flowers two or three; scape 3 to 6 in. long . . . . . *5. P. plicata.*

Flowers 7 to 15, racemose; scape 6 to 16 in. long.

Flowers 1 in. long; sepals and petals pink . . . . . *6. P. Gammieana.*

Flowers about ·65 in. long, sepals and petals green . . . . . *7. P. Scottii.*

1. Pogonia Hookeriana, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 129.

Stem 2 in. long, glabrous, with one or two sheathing bracts near the base. *Leaf* 2 in. broad, appearing with the flowers, reniform-orbicular, the margins undulate, the nerves sub-scaberulous near the base; *petiole* nearly as long as the stem, sub-scaberulous-striate. *Flowers* two, about 1 in. long; the *floral bract* linear-lanceolate, half as long as the pedicellate ovary. *Sepals* and *petals* sub-equal, linear-lanceolate. *Lip* oblong, with two short blunt sub-triangular side lobes about its middle, and an ovate-oblong sub-acute terminal lobe; the upper surface with three parallel ridges extending from its base to the end of the side lobes.

Sikkim, at an elevation of 3,000 feet; in flower in August; G. King, No. 2153.

Collected only once, and the exact locality unknown. The leaf and flower are contemporaneous, and in this respect the species is unique amongst the Sikkim species of the genus. The foregoing description is drawn up from a dried specimen. But, in accordance with the arrangement of figuring only species of which fresh specimens were available, no drawing of this has been printed.

2. Pogonia Prainiana, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 129.

Tuber globular, warted, ·5 to ·6 in. in diam. *Scape* 3 to 6 in. high, 1-flowered, bearing five or six bracts, the lower four or five being unequal sheathing and blunt; the uppermost acuminate and about 1 in. long. *Leaf* orbicular, reniform and plicate, 2·5 in. broad, its petiole 1 in. long. *Floral bract* triangular, minute, very much shorter than the ovary. *Flower* 1 in. in diam., nodding. *Sepals* narrowly oblong, blunt, ·75 in. long. *Petals* linear-oblanceolate, blunt. *Lip* longer than the sepals, the lower part convolute round the column; the side lobes short, triangular; the terminal lobe shortly sub-orbicular, its margins fimbriate and its disc with about seven densely glandular-pubescent vertical lines. *Column* clavate, *anther* elongate.

Sikkim, Lachoong Valley, at an elevation of about 6,500 feet; flowering in June; Pantling No. 372.

The sepals and petals are very pale green, as is also the convolute part of the lip; the apical lobe or expanded part of the lip is pink.

Plate 355.—*Pogonia Prainiana*, King and Pantling. Flowering and leaf-bearing plants, *of natural size*. Fig. 1 a flower, 2 bract, ovary and lip, *seen from the side*, 3 lip, 4 apex of ovary, column with anther *in situ*, 5 anther, *profile and front views; all enlarged*.

3. Pogonia macroglossa, Hook. fil. Ic. Plantar. t. 2195A.

Tuber sub-globose, faintly annulated and boldly warted, ·75 in. in diam. *Flowering stem* 3 to 6 in. long, mostly enveloped in one or two long, tubular, lax sheaths; *pedicel* about 1 in. long, bearing a single nodding flower slightly over an inch in length; *floral bract* oblong, convolute, erect, shorter than the shortly-stalked elliptic truncate ovary. *Sepals* and *petals* sub-equal, linear-lanceolate, sub-acute, slightly spreading. *Lip* gibbous at the base, slightly longer than the sepals, narrowly oblong; the basal half convolute round the column, and with two slightly raised lines along its upper surface; the apical half expanded, sub-acute, with two obscure side-lobes near its base. *Column* elongate, the apex slightly clavate, the lower part slightly curved. *Anther* broad, convex; *pollinia* narrowly clavate, conjoined, the lower ends very finely pointed. *Leaf* reniform, the apex bluntly apiculate, the edges sub-undulate, the petiole 3 in. long. Hook. fil. Fl. Br. Ind. VI, 120.

Sikkim, in tropical valleys, ascending to elevations of 4,000 feet; in flower during April; Pantling No. 261.

The sepals and petals are white, minutely streaked with rose-colour; the upper surface of the lip having, in addition to the rose-coloured streaks, deep rose-coloured spots. The flowering stems and sheaths are white flushed with rose, and the leaf is pale green flushed with pale brown, especially towards the centre.

Plate 356.—*Pogonia macroglossa*, Hook. fil. Three flowering plants and one leaf-bearing, *of natural size*. Fig. 1 floral bract, ovary and lip, *seen from the side*, 2 upper surface of lip, 3 apex of ovary and column with the anther *in situ* and the stigma, 4 anther, 5 pollinia; *all enlarged*; 6 tuber of flowering stem, *of natural size*.

4. Pogonia falcata, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 129.

Tubers globular, warted, ·25 to ·35 in. in diam. *Scape* 1·75 to 2·5 in. high, glabrous, 1-flowered, bearing several oblong sheathing thin membranous bracts at intervals. *Flower* ·4 to ·6 in. long including the ovary; the *floral bract* lanceolate, longer than the stalked ovary. *Sepals* and *petals* sub-equal, linear, acute, sub-connivent, ·3 to ·4 in. long. *Lip* oblong, convolute and embracing the column, the upper surface with a single broad thickened glandular-pubescent line from the middle to nearly the apex, the base not saccate, the disc pubescent, the lateral lobes falcate, acute, the terminal lobe obovate and very blunt. *Column* clavate, its anterior surface puberulous; the *anther* large and fleshy; the *pollinia* narrowly clavate-ellipsoid, stigma large.

Western Dooar of Bhotan, east of the Jaldacca river; flowering in April; Pantling No. 439.

A species near *P. velutina*, Par. and Reichb. fil., and *P. macroglossa*, Hook. fil. Only three plants of this have as yet been collected, and the leaf is still unknown.

Plate 357.—*Pogonia falcata*, King and Pantling. Three flower-producing plants, *of natural size*. Fig. 1 floral bract, ovary and flower, *side view*, 2 stalked ovary and lip *in profile*, 3 the lip flattened out, 4 apex of ovary, column with anther *in situ*, and stigma, 5 anther, 6 pollinia; *all enlarged*.

5. Pogonia plicata, Lindl. Gen. and Spec. Orch., 415.

Tuber globose, ·5 in. in diam. *Scape* 3 to 6 in. long, enveloped in two or three tubular sheaths with sub-acute dilated bifid apices, and a single linear-lanceolate bract above the sheaths. *Flowers* two or three, about ·75 in. long; *floral bract* very small, ovate, acute, shorter than the pedicel of the urn-shaped ridged ovary. *Sepals* and *petals* sub-equal, spreading, narrowly oblong-oblanceolate, acuminate. *Lip* ovate when flattened out, convolute and embracing the column, entire except the minutely emarginate apex, the midrib thickened and callus-like for more than half its length, the base slightly saccate. *Column* narrowed and sigmoidly bent in its lower half, the apex clavate. *Anther* broad, depressed, retuse, the clinandrium irregularly crenulate; *pollinia* four, narrowly oblong, the grains polymorphous. *Leaf* orbicular-cordate, the nerves shortly setose, the edges remotely ciliate, 3 or 4 in. long and about as much broad; petiole thickened in its upper half, nearly 2 in. long. Hook. fil. Fl. Br. Ind. VI, 119. *Epipactis plicata*, Roxb. Fl. Ind. III, 454. *Arethusa plicata*, Andr. Bot. Rep., t. 321.

Sikkim, near the base of the hills, at Sembree, elevation 1,500 feet; in flower during May; Pantling No. 140.

The sepals and petals are green. The lip is lilac with a green spot at the base and a yellow line along the thickened part of the midrib. The leaf is of a dark green beautifully mottled with purplish-brown; it lies flat on the ground, and appears some time after the flowers have withered.

Plate 358.—*Pogonia plicata*, Lindl. Flowering and leaf-producing plants, *of natural size*. Fig. 1 a flower, 2 apex of ovary, column and lip *in profile*, 3 the lip, flattened out, 4 floral bract, stalked ovary and column, showing the stigma and front of the anther, 5 anther, 6 pollinia; *all enlarged*.

6. Pogonia Gammieana, Hook. fil. in Bot. Mag, t. 6671.

Tuber globular, about 1·25 in. in diam. *Scape* of flowering plant 6 to 8 in. high, below about as thick as a goose-quill, bearing three long tubular bracts with acute or bifid apices. Peduncle about 2 in., shorter than the lax 7- or 8-flowered raceme. *Flowers* 1 in. long, drooping; *floral bract* linear-lanceolate, acuminate, longer than the truncate stalked ovary, strongly deflexed; stalk and ribs of the ovary winged. *Sepals* and *petals* sub-equal, elliptic-oblanceolate, acuminate, sub-connivent. *Lip* minutely saccate at the base, elliptic-obovate when spread out, the lower half convolute round the column and bearing two short triangular forward-pointing side lobes; the anterior half expanded, its edges crenulate-lobulate; the disc of the convolute part with two parallel central ridges, that of the expanded part with three ridges and many long wavy hairs. *Leaf* reniform, abruptly apiculate, glabrous, the edges undulate, 5 or 6 in. in diam. and about the same in length. *Petiole* 5 or 6 in. long, sheathed at the base. Hook. fil. Fl. Br. Ind. VI, 120.

Sikkim, at elevations of from 2,000 to 2,500 feet; in flower during May; Pantling No. 310. Gharwal; Strachey and Winterbottom No. 19; Falconer.

The sepals and petals are pink with lines of white and of dark pink. The lip is pale green in its apical and white in its basal half. The column is white, except the apex which is dark pink. The whole of the flowering axis is more or less shaded with pink, as are also the floral bracts and the ovary.

Plate 359.—*Pogonia Gammieana*, Hook. fil. A flower- and a leaf-bearing plant, *of natural size*. Fig. 1 portion of rachis, floral bract, stalked ovary and lip, 2 lip spread out, 3 apex of ovary, column with anther and stigma, 4 apex of the column, the anther having been removed, 5 anther, 6 pollinia; *all enlarged*.

7. Pogonia Scottii, Reichb. fil. in Flora, 1872, 276.

Tuber depressed-globular, 1·25 in. in diam. *Scape* of flowering plant 8 to 15 in. long, slender, bearing at the base two unequal tubular sheaths, with a third near the apex. *Raceme* 3 to 5 in. long, with numerous rather distant drooping flowers about ·65 in. long; *floral bract* linear, acuminate, longer than the stalked ovary, much deflexed; ovary and its stalk winged, the latter truncate at the apex. *Sepals* and *petals* sub-equal, linear-lanceolate, sub-connivent. *Lip* minutely saccate at the base, broadly sub-obovate when spread out, the lower two-thirds sub-convolute round the ovary and with bluntly triangular irregularly erose lateral lobes; the disc with three parallel hispid lamellæ; the anterior third or lobe broadly ovate, tapering to the sub-obtuse apex, its edges coarsely undulate-crenate, the upper surface velvety. *Column* clavate, nearly straight. *Anther* with a broad keel; *pollinia* oblong, conjoined. *Leaf* large, ovate-reniform, shortly and sharply apiculate, glabrous, 6 to 8 in. in diam.; petiole 4 to 8 in. long, smooth. Hook. fil. Fl. Br. Ind. VI, 120; in Ann. Bot. Gard. Calc., Vol. V, 62, t. 93. *Pogonia* No. 2, Griff. Notul. III, 377; Ic. Pl. Asiat., t. 345.

Sikkim, in tropical valleys about elevations of 2,500 feet; in flower during May; Pantling No. 143. Chittagong at Sitakund; Scott. ? Burma; Griffith.

The ovary, sepals and petals are green with dark red lines; the lip has its lateral lobes green with faint dark red oblique striæ, the disc being faint lavender and the

apical lobe of the same colour with bold irregular red markings. The anther and top of the column are red, the base white.

PLATE 360.—*Pogonia Scottii*, Reichb. fil. Flower- and leaf-bearing plants, *of natural size*. Fig. 1 a flower, 2 part of rachis, stalked ovary, and lip, *seen from the side*, 3 lip spread out, 4 ovary, column with anther *in situ*, 5 anther, 6 pollinia; *all enlarged*.

73. Corysanthes, R. Brown.

Very small, terrestrial, 1-leaved, 1-flowered herbs. *Leaf* cordate or sub-orbicular. *Flowers* large. *Sepals* unequal; the dorsal large, concave, concealing and arching over the column, the lateral pair filiform. *Petals* filiform like the lateral sepals, or absent. *Lip* large, erect, convolute round the column, its base usually with two short spurs; its apical lobe free, expanded, and with dentate or fimbriate margins. *Column* short, erect, 2-winged at the apex. *Anther* erect; *pollinia* oblong, free, or sessile on the rostellum. *Stigma* large. *Capsule* erect, on an elongate pedicel.

This genus is mainly Australasian; thirteen species being natives of Australia, New Zealand and Samoa, while five are Malayan. The flower is remarkable for the great development of the dorsal sepal, the lateral sepals being filiform; the petals also are either very small or, as in the present instance, altogether absent. Until the discovery of the species described below, no species of *Corysanthes* had been known to grow farther north than the central mountain range of Perak in the Malay Peninsula.

CORYSANTHES HIMALAICA, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 128.

Height of the entire plant 2 or 3 inches; the tuber ·25 to ·35 in. in diam., depressed-globose, hairy. *Stem* glabrous, with a single convolute sheath near its base. *Leaf* solitary, ·3 to ·5 in. long, sessile just under the flower, concave, cordate, acute, sometimes apiculate, green in colour, the midrib and nerves thickened and white. *Flower* solitary, ·6 in. long; the *bract* linear-lanceolate, slightly longer than the thick sessile ovary. Dorsal *sepal* oblanceolate, blunt, concave, arching over the column and the basal half of the lip; lateral pair short, filiform, bifurcate, lying between the two spurs of the lip. *Petals* none. *Lip* oblong, longer than the dorsal sepal, deflexed from about the middle; the basal portion convolute, with two short cylindric straight spurs at the base; the anterior half broadly ovate, concave, with unequally denticulate margins, the apex blunt. *Column* short, stout; *stigma* orbicular; *anther* erect.

Sikkim, at Lam-teng in the Lachen Valley, at an elevation of 9,000 feet, on a moist vertical rock; in flower in July; Pantling No. 385.

The dorsal sepal and lip are transparent and have rich dark purple markings. The nearest ally of this is *Corysanthes mucronata*, Blume, a native of high mountains in Java.

PLATE 361.—*Corysanthes himalaica*, King and Pantling. Four plants in various stages; *of natural size*. Fig. 1 leaf, bract, ovary, and flower, *in half profile*, 2 apex of ovary, column, stigma and empty anther, 3 the foregoing *in profile*, 4 dorsal sepal flattened out—*all enlarged*, 5 tuber; *of natural size*

74. Cephalanthera, Richard.

Terrestrial aphyllous herbs with tuberous roots, or leafy and with fibrous roots. *Leaves* (when present) sessile, plicate. *Flowers* in spikes or racemes, sub-erect. *Sepals*

and *petals* sub-similar, free, connivent. *Lip* shorter than and concealed by the sepals and petals, adnate to the base of the column, the basal half concave or saccate and embracing the column, the anterior half short and ribbed. *Column* semi-cylindric; the rostellum short or almost obsolete. *Anther* erect; *pollinia* two, bipartite. *Stigma* anticous. *Capsule* erect. Distrib.—North temperate regions; about 10 species.

CEPHALANTHERA ENSIFOLIA, Rich. Orchid. Annot., 29.

Stem green, 6 to 18 in. long, rising from a thin creeping rhizome. *Leaves* lanceolate or ovate-lanceolate, conduplicate, increasing in length and decreasing in breadth from below upwards, 2 to 4 in. long and ·4 to 1·25 in. broad according to the position on the stem. Peduncle 1 to 1·5 in. long. *Raceme* glabrous, longer than the peduncle, 8- to 20-flowered. *Flowers* from ·45 to ·6 in. long; *floral bract* ovate-lanceolate, acuminate, shorter than the ovary. *Ovary* shortly-stalked, sub-cylindric, lengthening with age. *Sepals* ovate-lanceolate, acute. *Petals* slightly smaller, elliptic, obtuse. *Lip* oblong, distinctly divided by an oblique narrow sinus into a hypochile and epichile; the former convolute, slightly ribbed; the latter concave, boldly 3- or 4-ribbed. *Column* long, terete. *Pollinia* linear-oblong, grooved, in pairs. Lindl. Gen. and Spec. Orchid 412; in Journ. Linn. Soc. I, 172, 175; Boiss. Fl. Orient. V, 85; Hook. fil. Fl. Br. Ind. VI, 125. *C. Xyphophyllum*, Reichb. Ic. Fl. Germ. XIII, t. 470. *C. acuminata*, Lindl. in Wall. Cat. 7405; Gen. and Spec. Orch. 412; Wight Ic., t. 1721; Decne in Jacquem. Voy. Bot. 164, t. 164.

Sikkim; near Gnatong, elevation about 12,000 feet; in flower during July and August; Pantling No. 364. Distrib. along the whole Himalayan range at suitable elevations from Bhotan to Kashmir. Distrib. also in Western Siberia, Affghanistan, Europe, Northern Africa. The flowers are white, the lip having a few yellow markings.

PLATE 362.—*Cephalanthera ensifolia*, A. Rich. A plant, *of natural size*. Fig. 1 apex of ovary and flower, *seen from the side*, 2 floral bract, ovary, column and lip, *seen from the side*, 3 lip, 4 apex of ovary, column and anther, 5 anther, 6 pollinia; *all enlarged*.

75. Epipactis, Adans.

Terrestrial herbs with green leaves and fibrous roots. *Leaves* sessile, plicate. *Flowers* racemose, drooping, *floral bract* elongate and often leafy. *Sepals* and *petals* broadly lanceolate, acuminate, strongly-nerved. *Lip* adnate to the base of the column, distinctly divided into hypochile and epichile; the hypochile strongly deflexed, concave or saccate, jointed to the epichile at a right angle, both entire. *Column* short; *stigma* large, anticous; rostellum broad, prominent. *Anther* erect, obtuse, its cells contiguous; *pollinia* two, bipartite, very narrow. Species about 10, Northern Temperate Hemisphere.

Sepals glabrous; hypochile globular-saccate, epichile broadly cordate . . *1. E. latifolia.*
Sepals pubescent externally; hypochile trough-shaped, epichile lanceolate . *2. E. consimilis.*

1. EPIPACTIS LATIFOLIA, All. Fl. Pedem., II, 152.

Whole plant 12 to 36 inches high. *Stem* slender, glabrous in the lower part, puberulous in the upper like the peduncle and raceme. *Leaves* broadly elliptic, occasionally sub-orbicular or ovate-lanceolate, many-nerved, acute, glabrous, but the

margins often ciliolate; 1·5 to 2·5 in. long and 1 to 1·5 in. broad, (smaller upwards). Peduncle 2 to 3 in. long. *Raceme* longer, 8- to 12-flowered, its rachis sometimes spiral. *Flowers* ·5 in. across; *floral bract* linear-lanceolate, acuminate, longer than the nearly glabrous stalked ovary. *Sepals* lanceolate, acuminate, glabrous. *Petals* similar but smaller. *Lip* shorter than the petals; the hypochile globularly saccate; the epichile broadly cordate, the edges erose, the upper surface with two globose calli near its base. *Column* very short, narrowed to the base; stigma broad. *Anther* erect, narrow; *pollinia* elliptic, falcate. Swartz in Act. Holm. for 1800, 232; Lindl. Gen. and Spec. Orchid. 461; Boiss. Fl. Orient. V, 87; Reichb. Ic. Fl. Germ. XIII, tt. 134-136; Hook. fil. Fl. Br. Ind. VI, 125. *E. macrostachya*, Lindl. in Wall. Cat. 7404. *E. consimilis*, Don Prod. Fl. Nep. 28. *E. Dalhousiæ*, Wight Ic. t. 1723.

Sikkim, at Gnatong, elevation about 11,000 feet; in flower during July; Pantling No. 330. Distributed westward along the range to Kashmir; also in Northern Asia, Europe and Northern Africa.

The whole plant is green, except the column which is pure white.

PLATE 363.—*Epipactis latifolia*, All. A small plant, *of natural size*. Fig. 1 a flower, 2 ovary, column with anther *in situ*, and lip, *side view*, 3 lip, 4 apex of ovary and front of column, showing the stigma and anther, 5 anther, 6 pollinia; *all enlarged*.

2. EPIPACTIS CONSIMILIS, Wall. Cat. 7403 (*not of Don*).

Height of the whole plant 18 to 24 in. *Stem* glabrous. *Leaves* lanceolate, acuminate, 6 to 8 in. long, the lowest the broadest, those of the upper part of the stem very narrow. Peduncle short. *Raceme* 4 to 6 in. long, laxly-flowered, tomentose like the peduncle. *Flowers* ·75 to 1 in. across, *floral bract* variable. *Sepals* unequal, concave; the dorsal lanceolate, acute; the lateral pair twice as wide, all spreading and pubescent externally. *Petals* ovate, acute, the midrib externally thickened and tomentose. *Lip* nearly as long as the sepals; hypochile of lip trough-shaped, bearing granular unequal calli inside, the two near the apex large, obtuse, semi-transparent and nectar-exuding; epichile lanceolate, with erect side lobes, the upper surface with a raised mesial line disappearing near the white apex. *Column* stout, much curved. *Stigma* large, sub-rotund and with two glands on the lower margin. *Anther* tumid. Hook. fil. Fl. Br. Ind. VI, 126. *E. veratrifolia*, Boiss. and Hohen. Diagn., Ser. I, XIII, 11; Boiss. Fl. Orient. V, 87; Lindl. in Journ. Linn. Soc. I, 174.

Sikkim, in damp ground in the Teesta valley at an elevation of about 1,000 feet; in flower during February and March; Pantling No. 125. Distributed along the mountain range from Nepal to Peshawar, also in Syria.

The sepals of this are on the outside of a deep lavender colour with white hairs; on the inner surface they are green with broad unequal vertical brown bands, and the petals on both surfaces are coloured like them. The hypochile of the lip is purple and the epichile bright pale brown, the apex being pure white. The column is green throughout.

PLATE 364.—*Epipactis consimilis*, Wall. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, stalked ovary, column with the anther *in situ*, and the lip, *side view*, 3 lip, 4 column, showing the stigma with its two glands and the anther, 5 summit of column and hypochile, 6 anther, 7 pollinia; *all enlarged*.

Tribe V.—GOODYEREAE.

Anther posticous, vertical but inverted; *pollinia* two, or four in two pairs, attached to a single gland either by one or by two caudicles, or without a caudicle; pollen granular or sectile.

Stigma single, anticous; pollinia two, or four in two pairs.

Lip spurred (except in *Corymbis* and one *Tropidia*).

Pollinia narrow, clavate, grooved, produced and united below to a single caudicle inserted on a long narrow gland; leaves plicate; stem erect (not decumbent at the base), sometimes branching.

Lip with a very long claw and an abruptly dilated apical lobe, the base neither saccate nor spurred. *76. Corymbis.*

Lip short, concave; the base saccate or spurred, not clawed . . . . . *77. Tropidia.*

Pollinia narrow, elongate, each inserted within a free horn-shaped caudicle with a gland at its base . . . . . *78. Herpysma.*

Pollinia clavate, grooved and bifid, united below and inserted on a small narrow elongate gland, caudicle none . . . *79. Physurus.*

Lip without spur claw or sac; pollinia clavate, grooved, inserted without caudicle on a small elongate gland . . . . . *80. Spiranthes.*

Lip saccate at the base, the sac usually setose or tubercled within; pollinia sessile on a variously shaped gland, caudicle none . . *81. Goodyera.*

Stigmas two, distant, lateral (united into a narrow transverse band in one species of *Zeuxine*, and conjoined and anticous in one species of *Anœctochilus*); pollinia two, bipartite (four in one species of *Anœctochilus*).

Lip inferior.

Sepals free.

Lip saccate or cymbiform at the base; the sac with calli or laminæ; mesochile when present not pectinate or toothed . . . . . *82. Zeuxine.*

Lip saccate or spurred at the base, and with a long toothed or pectinate mesochile (entire in one species); apical lobe with two divergent lobules . . . . . *83. Anœctochilus.*

Sepals united into a tube . . . . . *84. Cheirostylis.*

Lip superior . . . . . *85. Hetæria.*

76. Corymbis, Thouars.

Terrestrial rigid erect herbs with tall leafy stems and fibrous roots. *Leaves* broad, sheathing, plicate. *Sepals* and *petals* narrow, at first cohering in a tube, their tips alone free, finally quite free and spreading. *Lip* parallel to the column and adnate to its base, narrowly linear, without side lobes, channelled, the apex abruptly dilated and decurved. *Column* long but shorter than the perianth, straight, terete with a

clavate bi-auriculate tip, rostellum bifid; *stigma* single, two-lobed, anticous. *Anther* dorsal, vertical, 2-celled, the lip acuminate; *pollinia* long, narrow, deeply grooved, tapering slightly to the thin caudicle, gland peltate. *Capsule* linear or fusiform. Species six; all tropical.

CORYMBIS VERATRIFOLIA, Reichb. fil. in Flora XLVIII (1865), 184.

Stem 3 or 4 feet high and ·3 in. thick. *Leaves* elliptic-lanceolate, caudate-acuminate, sessile on the long ridged sheaths, length 12 to 18 in., breadth 3 to 4 in. *Panicles* 3 or 4 in. long, few-flowered. *Flowers* 1·25 to 1·5 in. long; the *bract* lanceolate, acuminate, shorter than the sessile ovary. *Sepals* linear-oblanceolate, acute, the upper half with inflexed edges. *Petals* like the sepals but flat and slightly shorter. *Lip* as long as the sepals with a long linear claw adpressed to the column; the apical lobe orbicular, slightly apiculate, the edges finely erose and minutely undulate. *Column* narrowly cylindric, the apex dilated; *stigma* with two deflexed lobes. *Anther* fleshy; *pollinia* attached by a slender caudicle to an elliptic gland. Hook. fil. Fl. Br. Ind. VI, 91. *C. disticha*, Lindl. Fol. Orch. 1 (*in part*). *Macrostylis disticha*, Breda Gen. and Spec. Orch. Javan., t. 2. *Hysteria veratrifolia*, Reinw. in Bot. Zeit. for 1825, II, 5; Lindl. Gen. and Spec. Orch. 439. *Rhyncanthera paniculata*, Blume Bijdr., t. 78. *Corymborchis veratrifolia*, Blume Orch. Archp. Ind., 105 tt. 42 E, and 43 f. 1. *C. assamica*, Blume l. c. 106, t. 43, f. 2 A. and B.

Sikkim, at elevations of 1,500 to 2,500 feet, in swampy ground; Pantling No. 475. Assam, Burma, the Andaman and Nicobar Islands. Distrib. Perak, Sumatra, Java, New Guinea.

The flowers are white in colour, and fragrant.

PLATE 354.—*Corymbis veratrifolia*, Blume. Part of a plant, *of natural size;* an entire plant, much reduced in size. Fig. 1 a flower, 2 bract, ovary, column and lip, side view, 3 lip, 4 upper part of column, front view, 5 side view of the same, showing polliniar gland (*g*), stigma (*s*), with its two lobes (*l*) and anther (*a*), 6 under surface of anther, 7 pollinia; *all enlarged.*

77. Tropidia, Lindl.

Terrestrial herbs with erect, often branching *stems*, glabrous, membranous, plicate, usually many-nerved *leaves* with sheathing petioles. *Flowers* resupinate, small, in terminal or leaf-opposed bracteate spikes. *Sepals* connivent; the lateral pair more or less connate, the dorsal (ventral in actual position) free. *Petals* similar to the sepals but usually smaller. *Lip* superior, adnate to the column, cymbiform or produced into a cylindric blunt spur, oblong, without side lobes, the apex reflexed, the disc with short or long intramarginal ridges or lamellæ. *Column* short or long; the rostellum very long, erect, often bifid. *Stigma* single, anticous. *Anther* erect, dorsal, acute or acuminate, the cells contiguous; *pollinia* two, narrow, clavate or cylindric, grooved or even bifid, attached by a single long slender caudicle to a narrow gland. *Capsule* cylindric-clavate. Species eight; Indian, Malayan and Chinese.

Lip spurred, leaves broadly elliptic	1. *T. angulosa.*
Lip not spurred, leaves narrowly elliptic-oblong . . .	2. *T. curculigoides.*

1. Tropidia angulosa, Blume Orch. Archipel. Ind. 122.

Stem 8 to 12 in. high, slender, erect, clothed with obtuse sheaths an inch or more in length, and bearing at the apex two broadly elliptic plicate many-nerved leaves with acute apices and widely sheathing bases, 4 or 5 in. long and 2 to 3 in. broad. *Spike* solitary, terminal, conical, shorter than the leaves, its peduncle bearing numerous linear spreading bracts nearly as long as the flowers. *Flowers* resupinate, crowded, ·65 in. long; *floral bract* lanceolate, caudate-acuminate, curving upwards, longer than the sessile ovary. *Sepals* sub-equal, oblong-lanceolate, the lateral pair connate nearly to the apex. *Petals* somewhat smaller and less acute. *Lip* about as long as the petals, oblanceolate-oblong, obtuse, entire, concave towards the base, adnate to the column, the base with a cylindric blunt spur half as long as and parallel to the column. *Column* short; the rostellum and anther very long, lanceolate, acuminate; *pollinia* clavate-cylindric, elongate, deeply grooved, united below; the caudicle long and slender; gland linear, half as long as the caudicle. *Capsule* clavate-cylindric, boldly ridged, ·75 in. long. Hook. fil. Fl. Br. Ind. VI, 92. *T. Govindovii* and *T. semilibera*, Blume l. c. *Decaisnea angulosa*, Lindl. in Wall. Cat. 7388. *Cnemidia angulosa* and *C. semilibera*, Lindl. Gen. and Spec. Orch. 463. *Govindovia nervosa*, Wight Ic. 2090.

Sikkim, in the valley of the Teesta, at elevations of about 1,000 to 2,000 feet; in flower during September and October; Pantling No. 349. Sylhet, Assam, Upper Burma and Tenasserim; also in Malabar and Travancore.

The flowers are white flushed with pale ochre-colour.

Plate 365.—*Tropidia angulosa*, Blume. Root and upper part of a plant, *of natural size.* Fig. 1 ovary and flower, 2 the conjoined lateral sepals, 3 floral bract, ovary, column, anther and lip, *side view*, 4 lip, 5 apex of ovary, column with anther *in situ*, *profile view*, 6 view of the under surface of the column, showing the stigma, 7 anther, 8 pollinia; *all enlarged.*

2. Tropidia curculigioides, Lindl. in Wall. Cat. 7386A; Gen. and Spec. Orch. 497.

Stem 1 to 2 feet high, slender, erect, sometimes branching. *Leaves* narrowly elliptic, tapering to each end, acuminate, sessile on the sheath, many-nerved, 3·5 to 6 in. long and ·65 to 1·25 in. wide. *Spikes* terminal and leaf-opposed, very short, bracteate, not exceeding ·75 in. in length. *Flowers* ·35 in. long, laxly scurfy-pubescent like the bracts and ovaries; *floral bract* ovate-lanceolate, equalling the short sessile ovary. *Sepals* sub-equal, lanceolate, acuminate, sub-connivent. *Petals* as long as the sepals, the midrib on the outer surface stout, falcately ovate-lanceolate. *Lip* narrowly oblong, tapering to the apex, concave, adnate to the footless column, as long as the lateral sepals, bi-gibbous at the base, without side lobes, its apex decurved; upper surface with intramarginal ridges about the middle. *Column* stout, the clinandrium broadly triangular. *Anther* fleshy; *pollinia* two, narrowly elliptic, the caudicle rather short and pubescent, the gland small. Hook. fil. Fl. Br. Ind. VI, 93. *T. assamica*, Blume Fl. Javæ, Orchid. 104, t. 41.

Sikkim, at Sembree, elevation 1,000 feet; in flower during November; Pantling No. 180. Sylhet, Assam and Burmah.

The flowers are white, faintly tinged with pale yellow. The anther is of a deep yellow.

PLATE 366.—*Tropidia curculigioides*, Lindl. Parts of a plant, *of natural size*. Fig. 1 floral bract, ovary and flower, *seen from the side*, 2 apex of ovary, column with anther *in situ*, and lip, *side view*, 3 lip, 4 apex of ovary, column and anther, 5 anther, 6 pollinia; *all enlarged*.

78. Herpysma, Lindl.

A terrestrial herb with leafy succulent stem, decumbent at the base. *Leaves* membranous, elliptic or ovate-lanceolate, petioled; the sheaths tubular, hyaline. *Flowers* crowded in a short sub-sessile raceme. *Sepals* sub-equal, free, puberulous, ovate-oblong, the dorsal forming a hood with the oblong petals. *Lip* adnate to the apex and sides of the column, its base with a long narrowly cylindric spur bifid at the apex and without calli in its interior. *Column* short, without appendages; the rostellum short, erect, bifid. *Anther* erect, narrow, 2-celled; *pollinia* two, narrow, elongate, bipartite at the apex only, each attached to a narrow tapering gland. *Stigma* one, anticous. A single species.

HERPYSMA LONGICAULIS, Lindl. in Wall. Cat. 7389; in Bot. Reg. under t. 1618.

Stem, including the decumbent part, 9 to 15 in. long and from ·2 to ·25 in. thick, the part under the leaves bearing pale truncate pubescent unequal membranous sheaths. *Leaves* ovate-lanceolate or narrowly-elliptic, tapering to each end, 2 to 3·5 in. long and ·75 to 1·5 in. broad. *Petiole* about ·25 in., its sheath 1 in. or more in length. *Raceme* pubescent, 1 to 1·25 in. long, sessile. *Flowers* about ·5 in. long, their ovaries longer; *floral bract* large, oblong-lanceolate, obtuse, nerved, exceeding the ovary. *Lip* oblong, deflexed from the middle, with two rounded toothed erect basal lobes; the apical lobe sub-quadrate, its apex with a broad blunt apiculus; the disc with two flattish calli about the middle and a lamella between them extending to the tip; the *spur* nearly as long as the ovary and parallel to it. *Column* short, contracted below the broad pulvinate central stigma. *Pollinia* elongated, each inserted at the base within a horn-like process ending in a gland, pollen-grains flattened. Lindl. Gen. and Spec. Orch., 506; in Journ. Linn. Soc. I, 178, 190; Hook. fil. Fl. Br. Ind. VI, 98; in Ann. Roy. Bot. Gard. Calc., Vol. V, 59, t. 88.

Sikkim, above Sureil, at elevations from 3,000 to 5,000 feet; Hooker; Pantling No. 240; in flower during August and September. Nepal; Wallich. Khasia Hills, alt. 4,500 feet; C. B. Clarke. Daphla Hills; Lister.

The flowers of this are white, the dorsal sepal and petals having the upper part of the midrib orange-red or pink, and the lateral sepals being tipped with the same colour.

PLATE 367.—*Herpysma longicaulis*, Lindl. A plant, *of natural size*. Fig. 1 floral bract and flower, 2 ovary, column with the anther *in situ*, the lip and its spur, *seen from the side*, 3 upper surface of lip, 4 view of the back of the column, the anther being *in situ*, 5 under surface of anther, 6 pollinia; *all enlarged*.

79. Physurus, Richard.

Terrestrial leafy herbs, with succulent stems decumbent at the base. *Leaves* thickly membranous, ovate or lanceolate, the petioles broad and sheathing at the base. *Flowers* in pedunculate spikes. *Sepals* free, the dorsal smaller than the two lateral and, with the petals, forming a hood. *Lip* attached to the base of the column without any claw, erect, produced downwards into a bifid spur parallel with the ovary and extending beyond the bases of the sepals, its interior without calli; apical lobe short, broad, recurved. *Column* very short, without appendages. *Anther* 2-celled. *Pollinia* two, clavate, bipartite. *Stigma* single, anticous. Species about 50, Asiatic and American.

PHYSURUS HERPYSMOIDES, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 124.

Whole plant 8 to 10 in. high; the *stem* about ·25 in. thick at the base, leafy and glabrous, the peduncle pubescent and bracteolate. *Leaves* three or four, obliquely ovate, acute, tapering below to the channelled sheathing petiole, 5- to 7-nerved; length 2·5 to 4 in., breadth 1·25 to 1·75 in., petiole 1·25 in. Bracts of the peduncle unequal, nearly 1 in. long, lanceolate, acuminate, adpressed. *Raceme* abrupt, 2 in. or less in length, pubescent; *floral bract* finely acuminate, slightly longer than the ovary. *Flowers* (to the tip of the spur) about ·75 in. long. *Sepals* oblong-lanceolate, 3-nerved, sparsely pubescent, spreading, ·4 in long. *Petals* linear, dilated towards their cohering apices, 1-nerved. *Lip* adpressed to the column, oblong, 5-nerved; the terminal lobe small, transversely oblong, entire, deflexed; the side lobes near the base, erect; sub-truncate; the spur shorter than the ovary, wide, slightly inflated below and bifid at the apex. *Anther* lanceolate. *Column* with a deep clinandrium. *Pollinia* clavate, the gland linear.

British Bhotan, above Engo; elevation 5,000 feet; in flower during April; Pantling No. 255.

This somewhat resembles *P. Blumei*, Lindl., but has a shorter and less pubescent inflorescence, longer bracts and larger flowers. The leaves have also twice as many nerves. The sepals and petals of this are of a pale reddish-brown, and the lip is white just as in *P. Blumei*. Only two specimens of it have been collected as yet.

PLATE 368.—*Physurus herpysmoides*, King and Pantling. Fig. 1 a flower, 2 ovary, column and lip, 3 the petals, 4 the lip, 5 column and spur, 6 under surface of anther, 7 pollinia; *all enlarged*.

80. Spiranthes, Rich.

Terrestrial herbs with tuberous or fibrous roots. *Stem* leafy. *Leaves* (in the Indian species) linear. *Flowers* small, secund, in a spiral spike. *Sepals* sub-equal, free, or sometimes cohering with the petals to form an erect hood, the lateral pair gibbous at the base. *Lip* erect, entire or 3-lobed, the base concave but neither saccate nor spurred, the disc bearing lamellæ or calli. *Column* short, terete. *Stigma* single, broad, anticous; rostellum erect, obtuse or elongate and bifid; *anther* erect, 2-celled; *pollinia* four, united in pairs, sessile on a small gland. Species about 80, temperate and tropical; only one Indian.

SPIRANTHES AUSTRALIS, Lindl. in Bot. Reg., *sub* t. 823.

Whole plant 6 to 18 in. high. *Stem* stout or slender, roots tuberous. *Leaves* four or five, alternate, clustered near the base of the stem, linear, shortly sheathing, acute or acuminate, sometimes oblanceolate, 1·5 to 4 in. long and ·25 in. or less broad. *Stem* with a few distant sheathing bracts ·5 in. long. *Spikes* 3 to 6 in. long; the rachis glandular-pubescent. *Flowers* in a spiral, crowded, ·1 to ·2 in. long; *floral bract* ovate, longer than the sessile ovary. *Sepals* sub-equal, ovate-oblong with broad bases, the apices acute and reflexed. *Petals* smaller than the sepals, linear, obtuse, the apices reflexed. *Lip* oblong, dilated at base and apex, the base sub-saccate, bi-glandular; the apex sub-quadrate, truncate, erose, the margins undulate. *Pollinia* cohering, clavate. *Capsule* fusiform, ridged, pubescent, ·25 in. long. Lindl. Gen. and Spec. Orch., 464; in Journ. Linn. Soc. I, 178; Dalz. and Gibs. Bomb. Fl., 270; A. Rich. in Ann. Sc. Nat., ser. 2, XV, 78; Hook. fil. Fl. Br. Ind. VI, 102. *S. flexuosa* and *S. parviflora*, Lindl. in Bot. Reg. under t. 823. *S. amœna*, Bunge Enum. Pl. China, 63. *S. Novæ Zelandicæ*, Hook. Handb. Fl. New Zeal., 243. *Neottia australis*, R. Br. Prod. 319; Don Prod. Fl. Nep. 27. *N. crispata*, Blume Bijdr., 406. *N. flexuosa* and *N. parviflora*, Smith in Rees' Cyclop. *N. sinensis*, Pers. Syn. II, 511. *N. amœna*, Bieb. Fl. Taur. Cauc. III, 606. *Gyrostachys australis*, Blume Fl. Jav. 107, t. 37, 38. *Spiranthes*, Griff. Notul. III, 384; Ic. Plant. Asiat., t. 348.

Sikkim, common from 2,000 to 8,000 feet; in flower during April and May and also during August and September; Pantling No. 107. Throughout the mountainous parts of India at suitable altitudes. Distrib. Affghanistan, Northern Asia, China, Java, Australia and New Zealand.

The flowers produced in spring are white; those appearing in autumn are often pink.

PLATE 369.—*Spiranthes australis*, Lindl. A plant in flower and fruit, *of natural size*. Fig. 1 bract, ovary and flower, 2 column with anther *in situ*, and lip, *seen from the side*, 3 lip, upper surface, 4 front view of the apex of ovary and column, showing the rostellum (*r*), stigma (*s*), pollinia (*p*), and anther (*a*), 5 profile view of the foregoing, 6 anther, 7 front and back views of the pollinia; *all enlarged*.

81. Goodyera, R. Brown.

Terrestrial leafy herbs. *Stem* decumbent below, erect above. *Leaves* usually rather thick, with wide sheaths and usually with petioles also. *Flowers* small, numerous, in terminal, sometimes secund, spikes or racemes. *Sepals* sub-equal, often pubescent outside; the dorsal concave and, with the *petals*, forming a hood over the column; the lateral pair free, sub-connivent or spreading. *Lip* attached to the base of the column, entire, saccate or cymbiform at the base; the apical lobe small, usually acute and decurved; the basal sac with setæ calli or ridges inside, rarely smooth. *Column* short, the rostellum projecting. *Anther* usually pyriform, with a long erect beak; *pollinia* 2, (4 in *G. grandis*) clavate, sessile on a large or small gland. *Stigma* undivided, anticous. Species about 36; temperate and tropical Europe, Asia, N. America, N. Caledonia and the Mascarene Islands.

Column without any callus or process on its face.
Sac of lip quite smooth within, globular, not projecting beyond the bases of the sepals . . . . . 1. *G. repens*.

Sac of lip with two ridges inside it, but without setæ or tubercles, globular, projecting beyond the bases of the sepals . . . . . 2. *G. fusca.*
Sac of lip setose within, sub-globular or oblong.
Petals united by their apices . . . . . 3. *G. vittata.*
Petals free.
Floral bract longer than the flower.
Petals oblong-lanceolate; apical lobe of lip with a scabrid thickening . . . . . 4. *G. Hemsleyana.*
Petals obliquely rhomboid, clawed; apical lobe of lip not lamellate . . . . . 5. *G. foliosa.*
Petals cuneately obovate, clawed; apical lobe of lip small, decurved, triangular . . . . 6. *G. procera.*
Floral bract shorter than the flower.
Plants from 6 to 12 inches high.
Petals sigmoidly lanceolate, entire, subacute . 7. *G. hispida.*
Petals falcately oblanceolate, the apex beaked, the outer margin erose . . . . . 8. *G. secundiflora.*
Plants from 1 to 4 feet high; petals linear-oblanceolate, acute, entire . . . . . 9. *G. fumata.*
Column with a clavate process on its face below the stigma . 10. *G. grandis.*

1. Goodyera repens, Brown in Ait. Hort. Kew., ed. 2, V, 198.

Height of whole plant 4 to 8 in. *Stem* glabrous, leafy below and bracteate above, gradually passing into the longer and pubescent peduncle. *Leaves* ovate-elliptic to elliptic, sub-acute, the peduncle sheathing in the lower half; length of blade ·5 to 1 in., breadth ·35 to ·45 in.; bracts in the upper part of the stem and on the peduncle linear, convolute, about ·5 in. long. *Raceme* sub-secund, 1 to 2 in. long, its rachis and the bracts and ovaries sparsely pubescent or sometimes sub-glabrous. *Flowers* globular, pointed, ·15 in. in diam.; *floral bract* linear-lanceolate, longer than the ovary. *Sepals* sub-equal, ovate, sub-acute, connivent. *Petals* about as long as the sepals, obliquely cuneate-oblong, falcately acute at the apex, the edges slightly erose-dentate. *Lip* about as long as the sepals, saccate at the base; the apical lobe short, oblong-ovate, sub-acute, concave, its edges somewhat undulate; the sac naked within. *Column* short, without processes; the *stigma* orbicular, rostellum short. *Anther* obovate, beaked; *pollinia* clavate, sessile on the large oblong-quadrate gland. Lindl. Gen. and Spec. Orch. 492; in Journ. Linn. Soc. I, 183; Reichb. Ic. Pl. German, XIII, 155, t. 482; Ledeb. Fl. Ross. IV, 86; Boiss. Fl. Orient. V, 90; Hook. fil. Fl. Br. Ind. VI, 111. *G. marginata*, Lindl. in Wall. Cat. 7394; Gen. and Spec. Orch., 493; in Journ. Linn. Soc. I, 183. *Satyrium repens*, Linn. Sp. Pl. 1339.

Sikkim, at elevations from 8,000 to 11,000 feet, common; in flower during July and August; Pantling No. 277. Westward along the Himalaya to Simla. Distrib. Europe, N. Asia and N. America.

The flowers are white flushed with brownish-pink. The leaves are green, beautifully reticulated with white.

Plate 370.—*Goodyera repens*, Brown. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 the same *in profile*, but with the sepals and petals removed, 3 the petals, 4 lip, 5 upper part of ovary and front of column, showing the stigma and end of the rostellum, 6 anther, 7 pollinia; *all enlarged*.

2. GOODYERA FUSCA, Lindl. in Wall. Cat., 7395; Hook. fil. Ic. Plantar. t. 2181.

Whole plant 9 to 12 in. high. *Stem* short, glabrous, with the leaves clustered near the base and bearing upwards large oblong acute bracts ·75 to 1 in. long. *Leaves* thick, ovate, sub-acute, 5-nerved, the veins anastomosing, the edges sub-revolute; length of blade 1 to 1·5 in.; the petiole about one-third shorter, broad, sheathing widely at the base. Peduncle longer than the stem, pubescent. *Raceme* many-flowered, not secund, the rachis bracts and ovaries pubescent; *floral bract* ovate-oblong, sub-acute, longer than the ovary. *Sepals* sub-equal, oblong, sub-acute, connivent. *Petals* linear-oblong, falcate, sub-acute. *Lip* as long as the sepals, with a deep sub-globose sac at the base, exserted beyond the bases of the sepals, smooth within, suddenly contracted in front into the linear beaked deflexed apical lobe. *Column* very short; the *stigma* broad, orbicular, convex. *Anther* convex, shortly apiculate but not beaked; *pollinia* broadly ovoid, sessile on the orbicular gland. Hook. fil Fl. Br. Ind. VI, 112. *Aetheria fusca*, Lindl. Gen. and Spec. Orch. 491; in Journ. Linn. Soc. I, 184. *Cystorchis fusca*, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 599.

Sikkim, the Lachong valley, at an elevation of about 12,000 feet; in flower during August; Pantling No. 411. Gharwal; Duthie.

The flowers are white, the apex of the lip being green and its sac flushed with pinkish-yellow.

PLATE 371.—*Goodyera fusca*, Lindl. A plant, *of natural size*. Fig. 1 ovary, floral bract and flower, 2 apex of ovary, column with anther *in situ*, and lip, *in profile*, 3 the petals, 4 lip, 5 front view of apex of ovary and column, showing the polliniar gland (*p g*) and stigma (*s*), 6 empty anther, 7 pollinia; *all enlarged*.

3. GOODYERA VITTATA, Benth. ex Hook. fil. Fl. Br. Ind. VI, 113.

Height of whole plant 4 to 8 in., everywhere glabrous or nearly so. *Stem* stout, enveloped in the long tubular leaf-sheaths. *Leaves* rather thick, ovate-lanceolate, acute, 1 to 2 in. long and ·6 to ·9 in. broad; *petiole* ·6 to ·8 in. long, consisting mostly of sheath. Peduncle only 1 to 1·5 in. long, bearing several narrowly lanceolate acuminate imbricate bracts. *Raceme* 2 to 3 in. long, secund, crowded, usually glabrous, sometimes sparsely hairy. *Flowers* ·35 in. long, horizontal; *floral bract* lanceolate, acuminate, slightly longer than the ovary. *Sepals* sub-equal, oblong-ovate, acute. *Petals* narrowly oblong-ovate, cohering by their inner edges for half their length. *Lip* longer than the sepals, with an elongate sac at the base setose inside, tapering to the oblong-lanceolate sub-acute recurved bilamellate apical lobe. *Column* short, stout. *Anther* with its beak acuminate and upturned; *pollinia* stoutly clavate, conjoined, tapering to a pseudo-caudicle and attached to an elongate gland; rostellum long, erect. *Stigma* large. Hook. fil. Ic. Plantar., t. 2185; Hook. fil. in Ann. Bot. Gard. Calc. 61, t. 92. *Georchis vittata*, Lindl. in Journ. Linn. Soc. I, 184.

Sikkim, at elevations of 6,000 to 10,000 feet; Hooker, Anderson. Lachong Valley, elevation 7,000 feet; in flower from July to September; Pantling No. 410.

The flowers are pink, a colour which passes into white at the bases of the sepals and petals. The leaves on the upper surface are green with a broad silvery band along the midrib; on the lower surface they are more or less suffused with purple.

PLATE 372.—*Goodyera vittata*, Benth. A plant, *of natural size*. Fig. 1 a flower with its ovary and bract, 2 profile view of column and lip, showing the anther *in situ* with its upturned beak, 3 the petals, 4 the lip, 5 column showing the anther behind, the rostellum at the apex and the stigma in front, 6 anther, 7 pollinia; *all enlarged*.

4. GOODYERA HEMSLEYANA, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 342.

Height of entire plant 6 to 10 in., of which 3 in. are spike. *Stem* enveloped in leaf-sheaths; roots few, thick. *Leaves* three to five, scattered, unequal, broadly ovate, acute, glabrous like the stem, dark green with white nerves, 8 to 1·8 in. long and ·5 to 1 in. broad. Peduncle shorter than the *raceme*, pubescent. *Raceme* 1 to 1·5 in. long, pubescent. *Flowers* sub-secund, ·5 in. long; the *bract* lanceolate, exceeding the ovary. *Sepals* 3-nerved, the lateral pair ovate-acuminate, the dorsal oblong-lanceolate and clothed externally with long sparse hairs. *Petals* oblong-lanceolate, falcate, 3-nerved. *Lip* oblong with a sharp tooth at each side of the mouth of the sub-saccate base; the apical lobe oblong, entire, obtuse, with scabrid disc, the sac setose within. *Pollinia* elongate-obovate, with a short caudicle and a long narrow lanceolate pointed gland.

Sikkim, on Senchal; elevation 7,000 feet; flowering in July; Pantling No. 215.

The flowers of this are white, the sepals being tipped with pink. This differs from *G. vittata*, Benth. notably by its laxly hairy sepals and by the scabrid disc of the lip. It is dedicated to Mr. W. B. Hemsley, F.R.S., formerly Assistant for India, now Principal Assistant, Herbarium, Royal Gardens, Kew.

PLATE 373.—*Goodyera Hemsleyana*, King and Pantling. A plant, *of natural size*. Fig. 1 profile view of flower, ovary and bract, profile of column and lip, part of ovary, column and lip, from the side, 3 lip, 4 and 5 posterior and anterior surfaces of column, 6 pollinia; *all enlarged*.

5. GOODYERA FOLIOSA, Benth. ex Hook. fil. Fl. Br. Ind. VI, 113.

Whole plant 6 to 12 in. high. *Stem* decumbent at the base. *Leaves* 3- to 5-nerved, distant, ovate-lanceolate, acute, somewhat oblique, narrowed to the base, the edges undulate; length 2·5 to 3·5 in., breadth ·75 to 1·65; petiole 1 in. long, slightly expanded into a short sheath at the base. Peduncle only 1 to 2 in. long, pubescent in its upper part like the *floral bracts* and bearing several lanceolate sheaths with tubular bases and acuminate apices. *Raceme* 1·5 to 3 in. long, its rachis and the bracts and ovaries glandular-pubescent. *Flowers* numerous, rather crowded, much exceeded by the lanceolate acuminate 3-nerved floral bracts. *Sepals* sub-equal, ovate-oblong, sub-acute, connivent, connate at the base. *Petals* obliquely rhomboid, with acute apices and long-clawed bases. *Lip* as long as the sepals, the base with a sub-globular sac hispid within and contracted into the oblong sub-acute apical lobe. *Column* and rostellum rather long. *Anther* erect, oblanceolate; *pollinia* narrowly clavate, vertically grooved, united at the lower end and sessile on a long oblanceolate gland. *Stigma* rotund, concave. Hook. fil. Fl. Br. Ind. VI, 113; Ann. Bot. Gard. Calc., vol. V, 61, t. 91. *Georchis foliosa*, Lindl. Gen. and Spec. Orch., 496. *Goodyera* sp. Griff. Itin. Not. 36, No. 591; Notul. III, 396, No. 11; Ic. Pl. Asiat. 346, fig. 1.

Sikkim, at elevations of 5,000 to 6,000 feet, Hooker; on Senchal as high as 7,000 feet; in flower during October and November; Pantling No. 5. Assam, Naga and Khasia Hills, ascending to 5,000 feet. Burma; Griffith. Perak at 7,000 feet; Wray.

The sepals are pinkish or orange-coloured externally with pale edges, and the petals are pale pink. The sac of the lip is yellow and its apical lobe is orange and white, the column being white and the anther yellow. The floral bracts and leaves are green, the latter with three silver lines.

PLATE 374.—*Goodyera foliosa*, Benth. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary, column with anther *in situ*, and lip, *in profile*, 3 lip, 4 the petals, 6 view of the back of the column, showing the anther *in situ*, 5 front of the same, showing the rostellum and stigma, 7 pollinia; *all enlarged*.

6. GOODYERA PROCERA, Hook. Exot. Flora, t. 39.

Whole plant 10 to 30 in. high. *Stem* glabrous, stout, enveloped in the wide lax sheaths of leaves or of fallen leaves. *Leaves* on long petioles, narrowly elliptic or ovate-elliptic, tapering to each end, acute or acuminate; the petiole stout, broadly sheathing in its lower half; length of blade 3 to 6 in., breadth ·75 to 1·75 in; petiole 1·5 to 3 in. Peduncle shorter than the stem, glabrous below, pubescent above, bearing several lanceolate acuminate bracts. *Raceme* with a pubescent rachis 3 to 8 in. long, many- and densely-flowered. *Flowers* sub-globose, ·2 in. in diam. across the tips of the pieces of the perianth; *floral bract* ovate-lanceolate, acuminate, pubescent at the edges, equalling the glabrous ovary in length. *Sepals* sub-equal, broadly ovate, obtuse, sub-connivent, glabrous. *Petals* cuneately obovate, clawed. *Lip* slightly longer than the sepals, with a large saccate base and a small decurved entire triangular acute apical lobe; the interior of the basal sac with two rows of long teeth on the sides and an oblong callus at the apex of each row. *Column* very short, with a transverse depression below the broad anticous stigma. *Anther* broadly pyriform, obtuse; *pollinia* clavate-cylindric, sessile on the small oblong gland. Lindl. Gen. and Spec. Orch. 493; in Journ. Linn. Soc. I, 183; Don Prod. Fl. Nep., 28; Wight Ic. t. 1729; Hook. fil. Fl. Br. Ind. VI, 111. *G. carnea*, A. Rich. in Ann. Sc. Nat. ser. 2, XV, 80. *Cionisaccus lanceolatus*, Breda Orch. Kuhl et Hassk., t. 1. *Cordylestylis foliosa*, Falconer in Hook. Journ. Bot. IV (1842), 75. *Neottia procera*, Ker in Bot. Reg., t. 639.

Sikkim, common at elevations of 1,000 to 4,000 feet; Pantling No. 67; in flower in May. Eastward to Bhotan and westward to Nepal. Assam, Sylhet, Khasia and Naga Hills, Nilgiri Hills and Western Ghâts, Ceylon. Distrib.—Java, China.

The flowers are white, faintly tinged with green, and the bracts are green.

PLATE 378.—*Goodyera procera*, Hook. Outline of an entire plant, much reduced in size. Leaf and inflorescence, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary, column with anther *in situ* and lip, *side view*, 3 the petals, 4 interior of the sac of the lip to show the teeth and calli, 5 front view of the apex of the ovary and of the column, showing the stigma and anther, 6 anther, 7 pollinia; *all enlarged*.

7. GOODYERA HISPIDA, Lindl. in Journ. Linn. Soc. I, 183.

Whole plant 4 to 6 in. high. *Stem* enveloped in the leaf-sheaths. *Leaves* elliptic-lanceolate, acute, somewhat oblique, especially at the base; length 1 to 1·5 in., breadth ·4 to ·65 in.; petiole none; sheath about ·4 in., very broad. Peduncle short, pubescent and bearing several short pubescent bracts with broad convolute bases and acuminate

apices. *Raceme* slightly twisted; the rachis bracts and ovaries covered with long thin sub-hispid hairs. *Flowers* numerous, rather crowded, ovoid, ·15 in. in diam.; *floral bract* lanceolate, acuminate, brown, conspicuous, longer than the almost sessile ovary. *Sepals* sub-equal, broadly elliptic, concave, obtuse, densely covered with minute glandular hairs, overlapping by their edges, the apices slightly expanded. *Petals* as long as the sepals, sigmoidly lanceolate, sub-acute. *Lip* slightly shorter than the sepals, with a sub-globose sac at the base with many setæ inside it, passing gradually into the oblong, sub-acute, almost horizontal, non-lamellate apical lobe. *Column* short, with a long beaked rostellum. *Anther* pyriform, depressed, with a long beak; *pollinia* narrowly clavate, bipartite, conjoined by their inner edges and inserted on a large oblong gland. Hook. fil. Ic. Plantar. t. 2186; Fl. Br. Ind. VI, 114.

Sikkim, at Kali Jhora in the valley of the Teesta, at an elevation of about 1,000 feet; in flower during September; Pantling No. 190. Khasia Hills; at Cherrapunji, elevation 4,000 feet, Hooker.

The sepals are olivaceous green, their tips being white; the petals and lip are of a dirty white. The bracts and rachis are brown, a colour which, in the stem, passes into brownish-purple. The leaves are green, flushed with pink towards the edges and beautifully reticulated with pure white.

PLATE 375.—*Goodyera hispida*, Lindl. A plant, *of natural size*. Fig. 1 bract, ovary, and flower, *front view*, 2 apex of ovary, bract and flower, *in profile*, 3 the petals, 4 the flower with the dorsal sepals and petals removed, *looked at from above*, 5 side view of the apex of the ovary, column with anther *in situ*, and lip, 6 longitudinal section of the lip to show the setæ in the interior of the sac, 8 pollinia; *all enlarged*.

8. GOODYERA SECUNDIFLORA, Griff. Notul. III, 393; Ic. Pl. As. 347, fig. 2.

Height of whole plant 6 to 12 in., slender, completely enveloped in the loose sheathing leaf-petioles, the upper part bearing long tubular acute bracts. *Leaves* few, scattered, ovate-lanceolate to elliptic-acute, the base rounded or narrowed into the stout sheathing petiole; length 1·5 to 3·5 in., breadth ·75 to 1·25 in.; *petiole* ·75 to 1 in.; peduncle pubescent, bearing several bracts like those of the stem. *Raceme* with its rachis and the floral bracts and ovaries densely glandular-pubescent or almost tomentose, many-flowered. *Flowers* broadly ovoid, ·35 in. long; *floral bract* shorter than or equal to the ovary. *Sepals* sub-acute, ovate, the dorsal narrower; the lateral pair sub-gibbous, spreading, sub-acute. *Petals* falcately oblanceolate, the apex obliquely beaked, crenate on the outer margin. *Lip* sub-globularly saccate at the base, the sac with slender setæ inside; the apical lobe ovate, acute, concave, its disc with two thick lamellæ. *Column* with a short rostellum; *anther* pyriform, the beak long; *pollinia* two, narrowly clavate, bipartite and attached to a long very narrow dark brown gland. *Stigma* orbicular. Lindl. in Journ. Linn. Soc. I, 182; Hook. fil. Fl. Br. Ind. VI, 113.

Sikkim, at Labba, elevation 6,000 feet; in flower during September to January; Pantling No. 292. Khasia Hills, elevation 4,000 to 5,000 feet; Griffith. Munipur; Watt. Distrib. China.

The parts of the flower are yellowish-pink, except the lip, which is white tipped with green. The leaves are pale green, mottled with a darker tint of the same colour.

PLATE 376.—*Goodyera secundiflora*, Lindl. A plant, *of natural size*. Fig 1 bract, ovary and flower, 2 apex of ovary, column with anther *in situ*, and lip, *side view*, 3 the petals, 4 the lip, *seen from above*, 5 apex of ovary and the front of the column, showing the rostellum and stigma, 6 anther, 7 pollinia; *all enlarged*.

9. GOODYERA FUMATA, Thwaites Enum. Pl. Ceyl., 314.

Whole plant about 3 to 4 feet high. *Stem* stout, ·5 in. thick, glabrous. *Leaves* obliquely oblong-elliptic, tapering to the acuminate apex and the long narrow base, 6 to 10 in. long and 1·75 to 4 in. broad; the *petiole* 1·25 to 2 in. long, sheathing widely in its lower part. Peduncle slender, glandular-pubescent. *Raceme* 8 to 10 in. long, its rachis and the bracts and ovaries glandular-pubescent, rather densely-flowered. *Flowers* ·5 in. long; *floral bract* linear-lanceolate, acuminate, one-third to one-half as long as the cylindric twisted ovary. *Sepals* unequal, pubescent outside; the dorsal ovate, acute; the lateral pair rather narrower and with reflexed apices, wide-spreading. *Petals* linear-oblanceolate, acute, entire, shorter and much narrower than the sepals, adpressed to the dorsal sepal. *Lip* with an elongate saccate base (rhomboidal when spread out), abruptly contracted into the linear revolute apical lobe; the interior of the sac setose. *Column* long, clavate, the rostellum rather short. *Anther* depressed, shortly beaked; *pollinia* narrow, sessile on the minute quadrate gland. Hook. fil. Fl. Br. Ind. VI, 111.

Sikkim, at Rungbee, elevation 6,000 feet; in flower during March; Pantling No. 467; a rare plant. Ceylon; Thwaites.

The colour of the sepals and petals is pale green, and that of the lip and column pale brown.

PLATE 377.—*Goodyera fumata*, Thwaites. Fig. 1 a flower, 2 profile view of floral bract, stalked ovary, column with anther *in situ*, and lip, 3 the lip with its apex flattened out, 4 column with the anther *in situ* and the stigma, 5 an empty anther, 6 pollinia; *all enlarged*.

10. GOODYERA GRANDIS, *new species*.

Height of the whole plant 15 to 20 inches, the *stem* forming three-fourths of the whole, leafy below, bracteate above. *Leaves* obliquely elliptic, sub-acute, 3-nerved, 3 to 4 in. long and 1·5 to 2 in. broad; petiole channelled, much dilated and tubular at the base, 2 to 2·5 in. long; bracts in the upper part of the stem about three, unequal, lanceolate, acuminate, tubular at the base, 1 to 1·35 in. long. Peduncle about 2·5 in. long, pubescent. *Raceme* rather densely-flowered, twice as long as the peduncle. *Flowers* ·7 in. across; *floral bract* lanceolate, longer than the sessile pubescent ovary, glabrous but with ciliate margins. *Sepals* unequal, thinly pubescent externally; the dorsal oblong-elliptic, blunt, somewhat fleshy, forming a hood with the spathulate *petals*; lateral sepals broadly lanceolate, wide-spreading. *Lip* fleshy, shorter than the column and adnate to its base, sub-globosely saccate, setose within; the apical lobe small, narrowly ovate, reflexed and adpressed to the under side of the sac. *Column* with a pointed apex and with a clavate callus extending from the stigma to the base of the lip. *Anther* dorsal, 2-celled; *pollinia* four, clavate, united in pairs to a single narrowly elliptic gland. *Hylophila ? hetærioides*, King and Pantling MSS.

Sikkim, at Rumtek in the valley of the Teesta, at an elevation of 4,000 feet; in flower during August; Pantling No. 460.

The flowers of this are of a dull red. This species in general appearance much resembles *G. foliosa*, Benth., but has shorter floral bracts. The details of the flowers of the two are also different. This, however, differs from all the species of the genus described in the present work by the clavate callosity on the anterior surface of the column below the stigma.

PLATE 379.—*Goodyera grandis*, King and Pantling. Part of a plant, *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column and lip, *in profile*, 3 lip, showing the setæ inside, 4 front of column, showing the base of the lip with a few of its contained setæ, the clavate process below the stigma and the rostellum, 5 the petals, 6 anther, 7 pollinia; *all enlarged*.

82. Zeuxine, Lindl.

Terrestrial herbs with succulent glabrous stems, decumbent at the base. *Leaves* membranous, sometimes withered at flowering-time. *Flowers* small, in racemes or spikes. *Sepals* sub-equal; the dorsal concave and forming a hood with the petals; the lateral pair free. *Lip* adnate to the base of the column, cymbiform or saccate; the apical lobe shortly clawed or sessile, divided into two oblong sub-quadrate more or less truncate diverging lobules, or entire, or with narrow decurved lobules; the sac at the base with calli or laminæ inside. *Column* very short, its anterior surface with lamellar or conical processes. *Stigmas* two, lateral, distant (united into a narrow band in *Z. pulchra*). *Anther* membranous, sometimes ridged, its cells contiguous; *pollinia* pyriform, attached by an oblong gland to the erect rostellum. Species about 15, natives of tropical Asia and Africa.

Sepals free.
- Stigmas united to form a narrow anticous band . . . . . 1. *Z. pulchra*.
- Stigmas two, distant, lateral.
  - Leaves linear, sessile; apical lobe of lip sub-orbicular, erose . . . 2. *Z. sulcata*.
  - Leaves ovate, ovate-lanceolate or oblong-lanceolate.
    - Apical lobe of lip not 2-lobulate, its margins introflexed . . 3. *Z. goodyeroides*.
    - Apical lobe of lip with two narrow decurved lobules . . . 4. *Z. abbreviata*.
    - Apical lobe of lip with two broad oblong or sub-quadrate diverging lobules.
      - Petals dimidiately rotund, abruptly apiculate.
        - Leaves oblong-lanceolate, blackish-purple; sepals acute; column with large lamellate processes . . . . . 5. *Z. glandulosa*.
        - Leaves ovate-lanceolate, green or green suffused with silvery grey; sepals blunt; column with medium lamellar processes . . . . . 6. *Z. nervosa*.
      - Petals narrowly oblong, blunt . . . . . 7. *Z. flava*.
      - Petals oblong, not falcate, acute; sepals, petals, bract and ovary pubescent.
        - Leaves ovate-lanceolate; column with two large vertical processes as long as and beneath the horizontal arms of the rostellum . . . . . 8. *Z. affinis*.
        - Leaves narrowly ovate; column with oblique processes much shorter than the linear arms of the rostellum . 9. *Z. reflexa*.

Sepals connate into a tube in their lower half.
- Apical lobes of lip short, truncate, diverging . . . . . 10. *Z. pumila*.
- Apical lobes of lip long, narrow, pointing forwards . . . . . 11. *Z. Franchetiana*.

1. Zeuxine pulchra, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 127.

Height of the whole plant about 6 or 8 inches. *Stem* 1·5 to 2·5 in. long. *Leaves* three or four, rather crowded, ovate, sub-acute, coriaceous; length about 1 in., breadth ·65 to ·75 in.; the petiole short, broad and sheathing at the base. Peduncle of the spike 3 in. long, covered with sparse flexuose white hairs and bearing two sheathing acute bracts about ·35 in. long. *Spike* under 1 in. long, 2- to 3-flowered; *floral bract* lanceolate, membranous, sparsely pubescent, shorter than the pubescent ovary. *Flowers* about ·35 in. long. *Sepals* ovate-lanceolate, all free, spreading and pubescent outside. *Petals* obliquely lanceolate, acute, curved, spreading. *Lip* longer than the sepals, the basal part cymbiformly saccate, having a single pair of teeth situated at the margin near the base and two calli within the sac; the terminal lobe deeply divided into two large divergent cuneate-subquadrate lobules erose on the outer margin. *Column* with eight tooth-like erect processes in front; stigmas united to form a narrow band across the column.

Sikkim, Lachoong Valley, 7,500 feet elevation; flowering in August; Pantling No. 412.

Only two specimens have as yet been gathered of this plant. The dorsal sepal does not cohere with the petals, and the stigmas are united to form an anticous band; but in all other respects this has the characters of the other species of the genus to which we have referred it.

The colour of the sepals and petals is pale brown, the lower part of the lip being yellow and its apical lobes white. The leaves are of a blackish-purple on the upper surface, the midrib being white.

Plate 380.—*Zeuxine pulchra*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 the petals, 3 upper surface of lip, 4 posterior surface of the column, showing the anther *in situ*, 5 front of the column, showing the united stigmas (*s*) and the processes, 6 lower surface of empty anther; *all enlarged*.

2. Zeuxine sulcata, Lindl. Gen. and Spec. Orch., 485.

Whole plant 2 to 10 in. *Stem* passing into the peduncle and, like it, glabrous. *Leaves* linear, acuminate, clasping, sessile on the hyaline truncate sheaths, gradually passing into linear bracts upwards. *Raceme* ·5 to 2 in. long, densely-flowered, nearly glabrous; *floral bract* ovate-lanceolate, acuminate, much longer than the ovary. *Sepals* unequal; the dorsal the broader, concave, ovate; the lateral pair obliquely lanceolate, connivent. *Petals*, like the lateral sepals, falcately oblong, blunt, united with the dorsal sepal to form a hood over the column. *Lip* as long as the sepals, with a small cymbiform sac at its base bearing inside two inward-pointing teeth, and two narrow lamellæ near the midrib; apical lobe short, sub-quadrate, entire and with a fleshy convexity situated within the outer angles *Column* very short, with two wings at its apex covering the anther; arms of rostellum short, stout, parallel. *Anther* depressed, very shortly beaked, covered by the wings of the column; *pollinia* clavate, sessile on an oblong gland. Lindl. in Journ. Linn. Soc. I, 186; Griff. Notul. III, 396; Ic. Plant. Asiat., t. 349; Blume Flora Javæ, Orchid. 55; Miquel Fl. Ind. Bat. III, 723; Hook. fil. Fl. Br. Ind VI, 106. *Zeuxine bracteata*, *Z. brevifolia* and *Z. robusta*, Wight Ic. 1724 *bis*, 1725, 1726. *Z. membranacea*, Lindl. Gen. and Spec. Orch. 486; in Journ Linn. Soc. I, 186; Blume Orchid. Flor. Javæ, 56.

Z. Tripleura, Lindl. in Journ. Linn. Soc. I, 186. *Z. integerrima*, Lindl. Gen. and Spec. Orch. 486; Blume Fl. Javæ, Orchid. 55, t. 19, and 23 C.; Miq. Fl. Ind. Bat. III, 723. *Z. emarginata*, Lindl. Gen. and Spec. Orch. 185. *Z. procumbens*, Blume Fl. Jav. 56, t. 22, f. 3 and t. 23 B. *Tripleura pallida*, Lindl. in Wall. Cat., 7391; Gen. and Spec. Orch. 452. *Adenostylis emarginata* and *A. integerrima*, Blume Bijdr. 414, t. 17. *Pterygodium sulcatum*, Roxb. Fl. Ind. III, 452.

Sikkim, at the base of the hills; in flower during January; Pantling No. 438. Throughout the whole of India in grassy places on the plains and at low elevations on the hills. Also in Ceylon, China, Java, the Philippines and in Affghanistan.

The flowers are white or pink, the lip being purple at the base and yellow at the apex. A variable plant, in some parts of India assuming a tall slender habit and sometimes attaining a height of 16 or 18 inches. In one form the flowers are larger than in the type, the lip is blunt and white at the base. In another form the lip is altogether white.

PLATE 381.—*Zeuxine sulcata*, Lindl. A plant, *of natural size*. Fig. 1 a flower and its bract, 2 petals, 3 lip, seen from above, 4 apex of ovary and column, side view, showing the membranous dorsal columnar wings (*w*) covering the anther, the stigmas (*s*) and the lip (*l*), 5 front view of the column, showing the bifid rostellum (*r*), the polliniar gland (*g*), stigma (*s*) and the dorsal wings of the column (*w*), 6 anther, under surface, 7 pollinia, upper and lower surfaces; *all enlarged*.

3. ZEUXINE GOODYEROIDES, Lindl. Gen. and Spec. Orch., 486.

Plant 4 to 9 in. high, the stem forming about one-third of the whole and bearing two to four oblong-ovate acute leaves with short petioles passing into coloured sheaths at the base, 1 to 1·25 in. long and ·65 to ·75 in. broad. Peduncle laxly-pubescent and bearing one or two linear-lanceolate bracts. *Raceme* 1 to 2 in. long, laxly-flowered, its rachis with a few hairs. *Flowers* ·25 in. long; *floral bract* almost equalling the ovary in length, ovate, acuminate. *Sepals* unequal; the dorsal ovate, acute; the lateral pair narrowly lanceolate, spreading, green. *Petals* falcate, sub-acute, connivent. *Lip* saccately cymbiform, the apical lobe small and with introflexed margins, the sac bidentate within. *Column* short, broad, marginally winged below. *Anther* beaked; *pollinia* clavate, attached to a broad caudicle with revolute margins about equal in length to themselves, the gland oblong-quadrate. *Stigmas* oval, lying on each side of the anther. Hook. fil. Fl. Br. Ind. VI, 107; Ic. Plantar., t. 2172; Ann. Bot. Gard., Calc. V, 60, t. 90. *Monochilus goodyeroides* and *M. galeatus*, Lindl. in Journ. Linn. Soc. I, 187.

Sikkim, at elevations of about 6,000 feet; in flower during September and October; Pantling No. 189. Assam, Burma.

The flowers are pink passing into white, except the lateral sepals which are often green. The floral bract is pink, and the leaves are velvety green with a pure white line along the midrib.

PLATE 382.—*Zeuxine goodyeroides*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 the petals, 3 lip, 4 posterior surface of the column, showing the anther *in situ*, 5 front of the column, 6 under surface of anther, 7 pollinia; *all enlarged*.

4. ZEUXINE ABBREVIATA, Hook. fil. Fl. Br. Ind. VI, 109.

Whole plant about 12 in. high. *Stem* glabrous, with a few scattered hyaline sheaths. *Leaves* four or five, unequal, lanceolate, on long petioles with broad sheathing

hyaline bases; length of blade 1·5 to 1·75 in., breadth ·5 to ·6 in.; petiole and sheath about 1 in. Peduncle about as long as the stem, with one or two short tubular sheaths, puberulous. *Raceme* 2 to 3 in. long, sparsely-flowered, the rachis puberulous. Flowers sub-globular, ·2 inches long; *floral bract* broadly-lanceolate, acuminate, as long as the stout ovary. *Sepals* sub-equal, ovate, acute.. *Petals* broader, obliquely ovate, acute. *Lip* longer than the sepals, saccate at the base, the sac with two lamellæ towards the midrib and a large callus on each side behind the lamellæ; the anterior part tapering to the decurved 2-lobulate apex; the lobules obliquely ovate, sub-acute. *Column* short and thick, with two vertical fleshy plates each divided into rectangular membranous wings below, rostellum short. *Anther* ovate, obtuse; *pollinia* clavate, the apices emarginate and the surfaces vertically grooved, sub-sessile on a narrowly elliptic gland. Hook. fil. Ic. Plantar. t. 2178. *Aetheria abbreviata*, Lindl. in Wall. Cat. 7385; Gen. and Spec. Orch., 491. *Etaeria lanceolata*, Reichb. fil. in Trans. Linn. Soc. XXX, 142. *Dossinia lanceolata*, Lindl. in Journ. Linn. Soc. I, 186.

Bhotan, in the Dooars at Ambiok, elevation about 4,000 feet; in flower during September; Pantling No. 346. Nepal; Wallich. Khasia Hills, at elevations from 4,000 to 5,000 feet; Hooker.

The sepals are pale brown and the petals pure white; the anterior part of the lip is also white, but the basal portion as well as the anther are pale yellow; at the base of the column are two brown spots.

Plate 383.—*Zeuxine abbreviata*, Benth. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary, column with anther *in situ*, lip and stigma, 3 petals, 4 section of lip showing one of the basal calli and one of the lamellæ (*l*), 5 apex of ovary, showing the column, rostellum (*r*), and stigma (*s*), 6 pollinia; *all enlarged*.

5. Zeuxine glandulosa, *new species*.

Whole plant 6 to 9 in. high. *Stem* bearing a few lax hyaline sheaths. *Leaves* oblong-lanceolate, acute, with a short petiole expanding into a wide hyaline sheath; length of blade 1 to 1·5 in., breadth ·25 to ·35 in. Peduncle short, pubescent, bearing two lanceolate glabrous bracts. *Raceme* about 1 in. long, densely glandular-pubescent. *Flowers* ·2 in. across; *floral bract* broadly ovate, bluntly acuminate, shorter than or equal to the densely glandular-pubescent ovary. *Sepals* connivent, ovate, acute, sub-equal, sparsely glandular-pubescent, the dorsal very concave. *Petals* sub-rotundly dimidiate, sub-oblique, each with a long terminal apiculus. *Lip* as long as the sepals, widely saccate at the base, the interior of the sac with a row of three lamellar calli on each side and an incurved conical tooth on each margin. *Column* with very large lamellate processes having their apices projecting forward, incurved, and touching; rostellum broad, projecting; *pollinia* pyriform, bifid and deeply grooved, attached to a large oblong elliptic gland having a small viscid area on its under surface. *Stigmas* two, small, narrowly oblong, situated near the base of the rostellum.

Bhotan Dooar near the Jaldacca river, at an elevation of about 2,000 feet; in flower during March; Pantling No. 434.

The prevailing colour in the flowers of this is olivaceous green, the column and the central contracted part of the lip being white.

This species is allied to *Z. nervosa*, Benth., but differs from that in having smaller leaves of a blackish-purple colour, shorter peduncle and raceme, and smaller flowers.

Moreover the columnar processes are different in shape from those of *Z. nervosa*. The specific name *glandulosa* is given to this on account of the large quantity of glandular hair on the inflorescence.

PLATE 384.—*Zeuxine glandulosa*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column with anther *in situ*, and lip, 3 petals, 4 lip, 5 section of the lip to show the three calli on one side of the sac and the conical process on its edge, 6 apex of ovary, column showing the rostellum (*r*), columnar calli (*c*), anther (*a*) and stigma (*s*); *all enlarged*.

6. ZEUXINE NERVOSA, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 600.

Whole plant 6 to 9 in. long, the stem glabrous and bearing near the ground one or two wide truncate scarious sheaths, and higher up two or three obliquely ovate-lanceolate acute leaves 1 to 2·5 in. long and ·65 to 1 in. broad; their petioles about ·75 in., expanding at the base into broad hyaline sheaths. Peduncle and rachis of *raceme* with sparse flexuose hairs, the former with one or two lanceolate acuminate bracts. *Raceme* laxly 3- to 8-flowered, about 1 to 1·5 in. long; *floral bract* ovate, acute, scarious, somewhat longer than the ovary, puberulous. *Sepals* ovate, blunt, the dorsal very concave, the lateral pair wide-spreading. *Petals* sub-rotund, dimidiate, abruptly apiculate at one side. *Lip* longer than the sepals, the base saccately cymbiform, the sac with three small parallel calli on each side of the interior near the base; apical lobe divided into two sub-quadrate spreading lobules. *Column* very short; the rostellum 2-lobed, very broad at the apex, and with a pair of rather small converging processes underneath; *pollinia* obovoid, bifid, attached to a broad oblong caudicle; the gland large, transparent, the adhesive portion being lanceolate and opaque. *Stigmas* two, minute, each situated within an angle of the lobed rostellum. Hook. fil. Fl. Br. Ind. VI, 108; Ic. Plantar. t. 2175. *Monochilus nervosum*, Wall. in Lindl. Gen. and Spec. Orch., 487; Lindl. in Journ. Linn. Soc. I, 187. *Etaeria nervosa*, Lindl. in Wall. Cat. 7381.

Sikkim; Hooker. Bhotan, at Kumai near the Jaldacca river, at an elevation of about 2,000 feet; Pantling No. 307; in flower during April. Cachar, Sylhet, Assam; Wallich, Mann, Clarke and others.

The sepals are green, the petals white, and the lobes of the lip yellow.

The leaves are green suffused with silvery grey, or green with a broad grey band along the midrib.

PLATE 385.—*Zeuxine nervosa*, Benth. A plant, *of natural size*. Fig. 1 bract, ovary and flower, *side view*, 2 half profile view of column, lip and stigma (*s*), 3 lip, 4 petals, 5 longitudinal section of the base of the lip to show the triple callus of one side of it, 6 apex of the ovary and the column, showing the anther (*a*), the stigma of one side (*s*), the rostellum (*r*), a lateral lobe of the column (*l*) the pair of converging calli (*c*), and the base of the lip after the anterior portion has been cut away (*b l*); *all enlarged*.

7. ZEUXINE FLAVA, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 600.

Height of the whole plant 6 to 10 in.; the stem about one-third of the whole, with two or three sheaths at the base and three or four leaves higher up. *Leaves* ovate or ovate-lanceolate with inflated hyaline sheaths, clustered at the top of the stem near the peduncle, withered at flowering time, 1·25 in. long and ·5 in. broad. Peduncle rather longer than the stem, pubescent and bearing two or three distant linear lanceolate bracts

·5 in. long; *raceme* much shorter than the peduncle, sparsely flowered. *Flower* ·15 in. long; *bract* lanceolate, as long as or longer than the stout ovary, sparsely villose. *Sepals* unequal, ovate-oblong, with a few lax hairs, the dorsal large and very concave, the lateral pair rather smaller. *Petals* narrowly oblong-elliptic. *Lip* longer than the sepals, cymbiform at the base and with two oblong calli enclosed in its folds; the anterior lobe with two sub-quadrate oblique diverging terminal lobules. *Column* short, stout, its apex curved forwards so as to make the anther horizontal, rostellum long; *pollinia* clavate; gland ob-clavate, transparent. *Stigmas* small, elliptic, one at each side of the anther. *Capsule* tumid, narrowly elliptic, ridged, ·3 in. long. Hook. fil. Fl. Br. Ind. VI, 108; Ic. Plantar., t. 2176. *Monochilus flavum*, Wall. in Lindl. Gen. and Spec. Orch., 487; in Journ. Linn. Soc. I, 187. *Etæria flava*, Lindl. in Wall. Cat. 7380 A. B.

Sikkim, at the foot of the range and ascending to 3,000 feet; in flower during May and June; Pantling No. 109. Westward to Nepal; Wallich. Assam; Griffith. Tenasserim; Helfer. Ceylon, Central Province, at 3,000 feet; Thwaites No. 3120. Distrib. Java, Borneo.

The ovary and sepals of this are of a dull grayish olivaceous tint; the petals and column are white, the latter tinged with brown; the posterior half of the lip is dull pink, the anterior half being yellow. The anther is pink.

PLATE 386.—*Zeuxine flava*, Benth. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 column and lip, 3 lip, 4 profile of column, showing the stigma (*s*), anther (*a*), side of the rostellum (*c*), and polliniar gland (*r*), 5 column, seen from above, 6 front of column, 7 pollinia; *all enlarged*.

8. ZEUXINE AFFINIS, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 600.

Height of entire plant 6 to 12 in. *Stem* stout, bearing several lax hyaline sheaths. Peduncle as long as or longer than the stem, with scattered slender hairs and two distant sheathing acuminate membranous bracts ·25 in. long. *Leaves* ovate-lanceolate, about 1·5 in. long, with short slender petioles and large hyaline sheaths. *Racemes* 1 to 3 in. long. *Flowers* ·25 in. long; *floral bract* broadly lanceolate, pubescent, nearly as long as the ovary. *Sepals* unequal, ovate-lanceolate, sub-connivent, laxly hairy. *Petals* smaller than the sepals, sub-obliquely elliptic. *Lip* with a cymbiform saccate base bearing two stout teeth at the point of insertion on the column; the apical lobe with two oblong recurved divergent truncate lobules. *Column* very short, with two large vertical processes beneath the two horizontally projecting lobes of the rostellum. *Stigmas* large, horizontal, elliptic, one lying behind each arm of the rostellum. *Pollinia* clavate, sub-sessile on the narrowly elliptic gland; *capsule* elliptic, narrow, ·3 in. long. Hook. fil. Fl. Br. Ind. VI, 108; Ic. Plantar., t. 2177. *Monochilus affine*, Lindl. Gen. and Spec. Orch. 487 (*excl. habitat Courtallam*). *Etæria affinis*, Lindl. in Wall. Cat. 7383. *E. flava*, Wall. Cat. 7380C. *Ætheria mollis*, Lindl. in Journ. Linn. Soc. I, 184.

Sikkim, in the Rungeet Valley, at an elevation of about 1,500 feet; Pantling No. 309; flowering in April. Bhotan Duars; Pantling No. 309; Haines, No. 603. Griffith, No. 5351 (Kew Distrib.). Khasia Hills; Clarke, No. 45314, Collett. Tenasserim; Wallich. Penang; Maingay.

The floral bract and the ovary and sepals are green, the petals whitish green and the lip yellow; the column is white, but the anther is pink. At the time of flowering the leaves are usually brown.

PLATE 387.—*Zeuxine affinis*, Benth. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 petals, 3 lip, 4 side view of column and lip, the anther (*a*), the two arms of the rostellum (*r*), a stigma (*s*), 5 stigma (*s*), gland of the pollinia (*g*), the columnar processes below the rostellum (*c*), the two arms of the rostellum (*r*), the anther (*a*), 6 lower surface of anther, 7 pollinia; *all enlarged*.

9. ZEUXINE REFLEXA, *new species*.

Whole plant 7 to 9 in. high. *Stem* about ·3 in. thick, succulent, bearing a few lax hyaline sheaths. Leaves narrowly ovate, acute, with a short petiole expanding into a wide hyaline sheath, withered at flowering time; length 1 to 1·25 in. Peduncle about as long as the stem, with long lax hairs and one or two short lanceolate bracts. *Flowers* ·25 in. long; *floral bract* lanceolate, nearly as long as the ovary. *Sepals* sub-equal, ovate-lanceolate, concave, laxly pubescent externally. *Petals* lanceolate, blunt. *Lip* longer than the sepals, saccate at the base, the interior of the sac with a single laminar callus at each side; apical lobe with two diverging oblong-quadrate lobules and a minute apiculus at the apex of the sinus between them. *Column* short, its processes obliquely oblong, horizontal, shorter than the linear arms of the rostellum, its anterior face concave. *Anther* elongate; *pollinia* obliquely clavate-oblong, sessile on the narrowly elliptic gland.

Sikkim, at Mungpoo, elevation 3,500 feet; in flower during April; Pantling No. 361.

The colour of the sepals is green and that of the petals white; the limb of the lip is yellow and its sac white.

This is allied to *Z. affinis*, but has a different column; the processes in this being horizontal while in that they are vertical. The apical lobules of the lip are also larger in *Z. affinis*.

PLATE 388.—*Zeuxine reflexa*, King and Pantling. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 profile of column and lip, one of the stigmas (*s*), 3 petals, 4 lip, 5 apex of ovary and column showing anther (*a*), stigma (*s*), columnar processes (*c p*), rostellum (*r*) and gland of pollinia (*p g*), 6 under surface of empty anther, 7 pollinia; *all enlarged*.

10. ZEUXINE PUMILA, King and Pantling.

Height of whole plant 3 to 5 inches. *Stem* decumbent at the base, erect upwards, stout for the size of the plant. *Leaves* rather thick, ovate, acute, the edges undulate; length ·35 to ·7 in.; petiole ·3 to ·4 in. long, expanding to a broad stem-clasping base. Peduncle only about 1 in. long, pubescent, bearing a single lanceolate acuminate bract tubular at the base. *Flowers* two to four, not crowded, sessile, broad at the base, ·35 in. long; *floral bract* broad, sub-acute, shorter than the sessile ovary. *Sepals* cohering, sub-equal, ovate; the dorsal concave, with an obtuse recurved tip; the lateral pair with very broad oblique bases, sub-acute. *Petals* as long as the sepals, oblanceolate-oblong, their apices abruptly and bluntly apiculate, crose. *Lip* longer than the sepals, with a wide shallow sac at the base having a large callus in its interior at each side; the claw in front of the sac long and narrow, convolute; apical lobe divided into two broad diverging obliquely-oblong lobules. *Column* short, thick, with a pair of small oblong processes near the middle in front. *Anther* fleshy, with a thick blunt lip. *Stigmas* large,

sub-rotund, inserted at the sides of the gland of the pollinia; *pollinia* obovoid-clavate, sessile on the pentagonal gland. *Odontochilus pumilus*, Hook. fil. Ic. Plant. t. 2163; Hook. fil. Fl. Br. Ind. VI, 99. *Cheirostylis pusilla*, (in part) Lindl. in Journ. Linn. Soc. I, 188 (*not of Gen. and Spec. Orch.*).

Sikkim, at Tendong, at elevations of about 6,000 feet; in flower during July; Thomson, Hooker, King, Pantling No. 162.

The flowers are pure white with a tinge of green on the claw of the lip.

PLATE 389.—*Zeuxine pumila*, King and Pantling. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 the petals, 3 the column and lip, *as seen from above*, also the stigmas (*s*), 4 the foregoing *in profile*, a stigma (*s*), 5 section of the base of the lip, showing one of the calli on its side within, 6 column showing anther (*a*), gland of pollinia (*g*), stigmas (*s*), and columnar processes (*c p*), 7 anther, 8 pollinia; *all enlarged*.

11. ZEUXINE FRANCHETIANA, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 341.

Height of the whole plant 6 to 9 in. *Roots* short, tubercular. *Stem* 6 to 9 in. long, the nodes slightly swollen. *Leaves* few, scattered, glabrous, linear-lanceolate and much reduced in the flowering plant; in the young plant ·25 to ·35 in. long, ovate and shortly petiolate. *Raceme* less than 1 in. long, pubescent, 1- to 2-flowered. *Flowers* ·25 to ·3 in. long; *floral bract* ovate, shorter than the ovary. *Sepals* oblong, curved, connate for one-third their length; the dorsal concave, shorter than the lateral pair. *Petals* broad, sub-quadrate, with an oblique midrib. *Lip* slightly exceeding the sepals, abruptly deflexed from the saccate base; the limb very shortly clawed, deeply divided into two linear obliquely sub-acute divergent lobules separated by a wide sinus. *Column* with two pyriform processes immediately beneath the rostellum. *Anther-beak* decurved. *Pollinia* sub-ovate, divergent when released from the anther; the caudicle acuminate and the gland oblong.

Sikkim, above Sureil; elevation 6,500 feet; flowering in August; Pantling No. 338.

A very distinct species named in honour of M. Franchet, the distinguished French botanist who has so successfully elaborated the extraordinarily rich collections made by the Abbé Delavay in the highlands of south-western China. This species is intermediate between *Cheirostylis* and *Zeuxine*. It resembles *Cheirostylis* in having a connate perianth, but the column is rather that of *Zeuxine*.

The flowers are white with a dash of green near the base of the lip.

PLATE 398.—*Zeuxine Franchetiana*, King and Pantling. Two plants in flower, and the upper part of the stems of two in leaf, *of natural size*. Fig. 1 floral bract, ovary and flower, 2 apex of ovary, column with anther *in situ*, stigma (*s*) and lip, *seen from the side*, 3 the petals, 4 lip, 5 section of lip to show the interior of the basal sac, 6 and 7 side and front views of the column with the columnar processes (*c p*), stigma (*s*) and rostellum (*r*), 8 anther, 9 pollinia; *all enlarged*.

83. Anœctochilus, Blume.

Terrestrial herbs with succulent stems decumbent at the base and with stout hairy roots. *Leaves* thick, ovate or lanceolate, with petioles sheathed at the base; peduncle and rachis of spike or raceme glandular-pubescent. *Sepals* free, unequal; the dorsal smaller, ovate, and with the beaked *petals* forming a hood over the column; the

lateral pair free or united at the base, spreading, larger than the dorsal. *Lip* adnate to the end of the column by a long toothed or pectinate rarely entire claw, saccate or spurred at the base, the sac produced beyond the bases of the sepals or quite covered by them, its interior with two tooth-like or laminar calli; terminal lobe with two large diverging oblong or sub-quadrate usually truncate lobules. *Column* short, with appendages in front. *Anther* 2-celled; rostellum twisted; *pollinia* two and bifid, rarely four, clavate, lamellate, narrowed into pseudo-caudicles, or attached to true caudicles and inserted on a narrow gland. *Stigmas* usually two, situated one at each side of the rostellum, or united into a transverse band on the column beneath it, rarely single and undivided. Species about forty; natives of India, and of the Malayan and Pacific Islands.

The genus *Anœctochilus* was founded by Blume in 1825. The same author, in 1858, instituted his genus *Odontochilus*, separating it from *Anœctochilus* on account of the shorter sac of its lip and of its being concealed by the bases of the sepals; and also because of the more developed columnar processes. Lindley had, in 1840, founded his genus *Hæmaria*, which he differentiated from *Anœctochilus* chiefly by the claw of the lip being entire and by its sac being hidden by the bases of the petals. These distinctions appear to be insufficient to justify generic rank; and as Sir Joseph Hooker, in a note under *Odontochilus Clarkei*, in his Icones Plantarum (t. 2168), gives it as his opinion that *Odontochilus* and *Anœctochilus* should be united, we now venture, not only to carry out the union, but also to include *Hæmaria*. We feel the more justified in doing this, since dissection of living flowers of several of the species included in *Odontochilus* as it stood, discloses divergencies in the stigmatic character which appear to us of more importance than those depended upon for the separation of the three genera just mentioned. In the genus thus constituted the pollen-masses taper into long caudicle-like prolongations by which they are attached to the gland. These pseudo-caudicles are composed of lamelliform grains connected to each other by elastic threads.

Stigmas two, distinct and situated one on each side of the rostellum.
  Spur or sac of lip conical and projecting beyond the bases of the sepals, not septate, the contained calli oblong.
    Claw of lip with long fimbriate teeth; petals with long narrow curved beaks . . . . . *1. A. Roxburghii.*
    Claw of lip with short teeth; petals with short broad beaks . . . *2. A. Sikkimensis.*
Stigmas two, united by their inner margins and forming a transverse band across the front of the column below the rostellum.
  Claw of lip deeply toothed or fimbriate.
    Sac of lip covered by the generally united bases of the sepals, globose, didymous, septate and with a usually recurved conical spur-like callus in each chamber . . . . . *3. A. lanceolatus.*
    Sac of lip oblong, parallel with the ovary, not bifid, containing two sub-quadrate lamellar calli . . . . . *4. A. grandiflorus.*
    Sac of lip globose, shortly bifid, containing two short conical teeth . . . . . *5. A. Elwesii.*
  Claw of lip not toothed . . . . . *6. A. crispus.*
Stigma one, undivided, occupying the front of the column below the rostellum and above the columnar processes . . . . . *7. A. tortus.*

1. Anœctochilus Roxburghii, Lindl. in Wall. Cat. 7387; Gen. and Spec. Orch., 499.

Height of the entire plant not exceeding 12 inches, half being stem and half inflorescence. *Leaves* ovate or ovate-oblong, acute; the petioles short and somewhat

expanded at the base, glabrous like the stem. Peduncle glandular-pubescent, bearing three to five scattered oblong sheathing bracts with acuminate apices. *Raceme* much shorter than the peduncle, bearing two to five resupinate flowers about ·8 in. long; *floral bract* half as long as the sessile cylindric ovary, glandular-hairy like the ovary. *Sepals* unequal; the dorsal broadly ovate, acuminate, its apex shortly recurved; the lateral pair oblong, acute, all glandular-hairy. *Petals* smaller than the sepals, obliquely oblanceolate with hooked apices. Base of *lip* adpressed to the face of the column and with two calli; claw with seven or eight pairs of slender unequal horizontal fimbriæ; terminal lobes linear-oblong, blunt, widespreading, recurved. Appendages on the front of the column large, parallel, extending from the ovate fleshy rostellum to the spur. *Stigmas* two, elliptic, small. *Spur* as long as the lateral sepals, tapering to the minutely bilobed apex, and having two large wart-like processes inside. *Anther* acuminate; *pollinia* four, clavate, in two pairs united at their bases and both attached to a lanceolate gland. Blume Floræ Javæ, Orchid., 41, t. 12 B, fig. 2; Hook. fil. Fl. Br. Ind. VI, 95. *Chrysobaphus Roxburghii*, Wall. Tent. Fl. Nep., 37, t. 27.

Sikkim, in the bottoms of tropical valleys and along the base of the range; in flower during November; Pantling No. 6. Westward to Kalka and eastward to Bhotan; also in Assam, Sylhet and Munipur.

The sepals and petals are of a very pale pink, almost white, the lip being pure white. The leaves have a velvety lustre and are purplish-red with golden reticulations; in the mid-area of the leaf the red passes into golden or greenish-yellow tinged with pink.

PLATE 390.—*Anœctochilus Roxburghii*, Lindl. A plant in flower, *of natural size*. Fig. 1 a flower, 2 bract, sessile ovary, column, stigma (*s*), spur and lip, *in profile*, 3 the petals, 4 front view of the column and spur, the anterior wall of the latter having been removed to show the two wart-like processes in its interior, also the rostellum (*r*) and the stigmas (*s*), 5 empty anther, 6 pollinia; *all enlarged*.

2. ANŒCTOCHILUS SIKKIMENSIS, King and Pantling Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 124.

Whole plant 6 to 9 in. high. *Stem* procumbent and about ·25 in. thick near the base, with four or five leaves, glabrous. *Leaves* elliptic-ovate, acute, narrowed to the broadly sheathing petiole; length 2 to 2·5 in., breadth 1 to 1·35 in.; petiole ·65 in.; peduncle of the raceme glandular-pubescent and with several distant sheathing acuminate bracts ·5 in. long. *Raceme* 1·75 to 2·25 in. long, glandular-pubescent; *floral bract* lanceolate, shorter than the ovaries. *Flowers* ·6 in. long. Dorsal *sepal* oblong, blunt, concave; lateral pair oblong, acute, spreading. *Petals* dimidiate, straight along the inner margin, dilated upwards along the outer, and broadly beaked near the apex. *Lip* with two terminal divergent obliquely cuneate lobes; the claw with four pairs of short forward-pointing teeth. *Spur* short, pouch-like, bifid, the calli within it ovoid. *Column* with two parallel raised lines below the large ovate rostellum resting on a large forcipate process, beneath which again are two flat converging calli. *Pollinia* flattened, curved, oblong, sub-equal in length; the gland embraced by the united bases of the pseudo-caudicles.

Sikkim, at 3,000 to 5,000 feet elevation; not uncommon; flowering in September; Pantling No. 285.

The sepals are olive-green and white; the lip is white, the teeth of the claw being green, as are also the column and spur. The upper surface of the leaves is of a very dark red colour with a velvety sheen and veined with golden yellow, the lower surface is of a uniform dull red.

This differs from *A. Roxburghii* (which it resembles in leaves) in its smaller flowers, differently shaped petals and pollinia, also in the terminal lobes of the lip. and in the teeth of the claw which in this are much smaller. Its nearest ally as regards floral structure is, however, *A. Griffithii*, Hook. fil., a species of the Naga Hills, which has green leaves without reticulations, and a more distinctly winged claw with larger teeth and a longer spur.

PLATE 391.—*Anœctochilus Sikkimensis*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column and lip, *in profile*, 3 front of column and portion of the spur with the anterior wall cut away to show the two calli, 4 petals, 5 lower surface of anther, 6 pollinia; *all enlarged*.

3. ANŒCTOCHILUS LANCEOLATUS, Lindl. Gen. and Spec. Orch. 499.

Whole plant 9 to 12 in. high. *Stems* glabrous, decumbent at the base and with a few annular thickenings. *Leaves* ovate or ovate-lanceolate, acute or sub-acute, narrowed to the base, 1·25 to 2·25 in. long; petiole ·75 to 1 in., with a wide tubular or sheathing base. Peduncle short, pubescent, and bearing one or two ovate-lanceolate acuminate sheaths, tubular at the base and pubescent. *Raceme* longer than the peduncle, laxly many-flowered, the rachis pubescent. *Flowers* about ·75 in. long; *floral bract* ovate-lanceolate, acuminate, sub-glabrous, as long as the glabrous ovary. *Sepals* unequal; the dorsal ovate, acute; the lateral pair larger, ovate-oblong, 1-nerved, obtuse, spreading. *Petals* as large as the dorsal sepal and, with it, forming a hood over the column, dimidiately reniform, acuminate. *Lip* with a globose didymous basal sac containing two long spur-like processes; the claw with seven or eight pairs of oblique unequal coarse teeth; the apical lobe with two diverging oblong obliquely truncate lobules, the sinus between them broad and minutely apiculate at its apex. *Column* very short, thick, with two obtusely triangular processes; rostellum broad. *Anther* with an oblique recurved beak; *pollinia* obovoid, united through a sigmoid pseudo-caudicle to the small oblong gland; the pollen grains cuneiform. *Stigmas* two, large, lateral. Lindl. in Journ. Linn. Soc. I, 179. *A. luteus*, Lindl. l. c. 179. *Odontochilus lanceolatus*, Benth. in Gen. Plantar. III, 601; Hook. fil. Fl. Br. Ind. VI, 101; in Ann. Bot. Gard. Calc. V, 59, t. 89. *O. flavus* (error for *O. luteus*), Benth. Gen. Plantar. III, 598.

Sikkim, at elevations of from 5,000 to 6,000 feet; Griffith (Kew Distrib. No. 5345); Clarke, Gammie, Prain, King, Pantling No. 196 and 461. Yoksum at 7,000 feet; Pantling No. 461; in flower during July, August and September. Khasia Hills; Griffth (Kew Distrib. No. 5352).

The sepals and petals are of a pale green, the dorsal sepal being tinged with brown; the lip is of a brilliant yellow and the anther is pink. The leaves are green with three bright white nerves.

PLATE 392.—*Anœctochilus lanceolatus*, Lindl. A plant, *of natural size*. Fig. 1 a flower, *seen from above*, 2 side view of floral bract and ovary, column with anther *in situ*, and base of lip, 3 section of preceding, showing the septum and one of the two spur-like calli inside the sac of the lip, 4 front of the column, showing the anther (*a*), gland of the pollinia (*g*), a stigma (*s*), columnar processes (*p*), and portion of the sac (*c*), 5 pollinia; *all enlarged*.

4. Anœctochilus grandiflorus, Lindl. in Journ. Linn. Soc. 1, 179.

Whole plant 12 to 18 in. high; the *stem* decumbent at the base, succulent, ·35 in. thick, glabrous; the roots stout and very hairy. *Leaves* elliptic or elliptic-rotund, sometimes oblique, sub-acute, many-nerved, narrowed to the long stout petiole; length 2·75 to 3·75 in., breadth 1·5 to 2 in.; petiole 1·4 to 1·75 in. Peduncle 2 to 2·5 in. long, sparsely pubescent, and with two or three broad sheathing ovate bracts. *Raceme* longer than the peduncle, laxly many-flowered, the rachis laxly pubescent. *Flowers* ·75 in. long; *floral bract* ovate-lanceolate, convolute, glabrescent, about half as long as the glabrous ovary. *Sepals* unequal, glabrous; the dorsal ovate, concave; the lateral pair slightly larger, spreading, oblong, somewhat falcate, sub-acute, connate with each other at the base and with the sac of the lip. *Petals* about as large as the dorsal sepal, falcately oblanceolate, bluntly acuminate. *Lip* with a rather long oblong horizontal sac or spur at the base decurrent on the ovary; the claw long and with distant and unequal teeth on each side; apical lobe with two oblong diverging lobules with truncate erose apices; the sinus very wide and with a minute apiculus at its apex; the sac with a lateral sub-quadrate apiculate callus on each side in its interior. *Column* short, with two narrow appendages; rostellum large, broad, bifid. *Anther* much pointed; *pollinia* clavate, compressed, the apices emarginate, united below and joined directly to the small gland by a long pseudo-caudicle. *Stigmas* two, conjoined, anticous. *Olontochilus grandiflorus*, Benth. in Gen. Plantar. III, 598; Hook. fil. Fl. Br. Ind. VI, 100.

Sikkim, at elevations of from 4,000 to 6,000 feet; Hooker; at Tendong, Pantling No. 325; in flower during July. Khasia Hills; Hooker and Thomson.

The sepals and petals are pale green, mottled with white and tipped with pink. The lip is white, the teeth of the claw being green and the sac being flushed with yellow; the column is green below and pink above. The leaves on both surfaces are pure green. The flowers at the middle of the raceme are occasionally the first to open, expansion proceeding upwards and downwards simultaneously as shown in the plate.

Plate 393.—*Anœctochilus grandiflorus*, Lindl. A plant, *of natural size*. Fig. 1 a flower, *seen from above*, 2 apex of ovary, spur of lip, column and anther, *seen from the side*, the stigma (*s*), the rostellum and the gland of the pollinia (*g*), 3 front of column with the transverse united stigmas and the gland of the pollinia (*g*), 4 the petals, 5 section of column and spur, showing one of the calli in the interior of the latter, 6 pollinia; *all enlarged*.

5. Anœctochilus Elwesii, King and Pantling.

Whole plant 8 to 10 in. high. *Stem* rather stout, decumbent at the base, glabrous. *Leaves* six or seven, ovate, acute, narrowed at the base, 3-nerved, the margins hyaline, length 1·25 to 1·75 in.; petiole about ·5 in., expanded at the base. Peduncle shorter than the stem, clothed with long soft glandular hairs and bearing several lanceolate acuminate bracts. *Raceme* shorter than the peduncle and, like it and the floral bracts and ovaries, glandular-hairy. *Flowers* two or three, about 1 in. long; *floral bract* lanceolate, as long as the ovary. *Sepals* unequal, the dorsal ovate-cordate, sub-acute; the lateral pair much larger, broadly oblong, sub-falcate, blunt, diverging. *Petals* broadly oblong, falcate, acute, about as long as the dorsal but much shorter than the lateral sepals, 1-nerved, and with a few long hairs outside. The basal sac of the *lip* shallow, shortly bifid, and containing within it two conical

calli; the claw narrow and bearing about six pairs of coarse teeth on each side; the apical lobe divided by a broad deep sinus into two diverging obliquely-oblong or sub-quadrate truncate undulate lobules. *Column* stout with two parallel appendages in the neck of the spur. *Anther* beaked; *pollinia* ob'ique, unequal, clavate but flattened, pseudo-caudicle short; gland situated on one side of the twisted beak of the anther. *Stigmas* confluent in front of the column. *Odontochilus Elwesii*, Clarke ex Hook. fil. Fl. Br. Ind. VI, 100; Hook. fil. Ic. Plantar., t. 2167.

Sikkim, at Choongthang, Tendong, Pankasari, &c., at elevations of from about 3,000 to 6,000 feet; Clarke, King, Pantling No. 224; in flower during July and August. Khasia Hills, at Shillong; Clarke. Naga Hills, at Kohima; Prain No. 17.

There is some variation in the colouring of the flowers and leaves of this species. The common form in Sikkim has the sepals green with white midribs and brown tips, and the petals white, also tipped with brown. The lip is white, but the teeth of the claw are brown and the basal sac is green. The leaves are of a uniform brown, as also is the axis. Dr. Prain, who made careful notes on the plant as it grows at Kohima in the Naga Hills, describes the sepals as coloured like those of the Sikkim plant; the petals being green and the claw of lip yellow for the most part, but having a red central line and its teeth being greenish-yellow, the apical lobules being white. The leaves he describes as olive green on the upper surface and coppery on the lower.

PLATE 394.—*Anœctochilus E'wesii*, King and Pantling. A plant, *of natural size* Fig. 1 the sepals and petals separated, 2 the lip with its sac and the apex of the ovary and column, *seen from above*, 3 anterior surface of column and apex of ovary; portion of the sac of the lip, the anterior part having been removed so as to show one of the teeth within it and the columnar appendages, also the gland of the pollinia (*g*), 4 anther with the pollinia *in situ* and polliniar gland (*g*), 5 empty anther, 6 pollinia with gland (*g*), 7 the base of the pollinia to show the relation of the gland (*g*); *all enlarged*.

6. ANŒCTOCHILUS CRISPUS, Lindl. in Journ. Linn. Soc. I, 180.

Whole plant 5 to 8 inches high. *Stem* decumbent at the base, slender. *Leaves* few, ovate, acute, the edges minutely undulate, length ·5 to ·75 in.; petiole ·35 to ·65 in long, dilated at the base. Peduncle much shorter than the stem, pubescent and with one or two pubescent lanceolate sheaths with acuminate apices and tubular bases. *Spike* 4- to 8-flowered. *Flowers* ·7 in. long; *floral bract* pubescent, lanceolate, about as long as the glabrous ovary. *Sepals* unequal, pubescent; the dorsal convex, its apex upturned; the lateral pair longer, spreading, oblong, with obliquely sub-acute apices. *Petals* triangular-falcate, conniving under the dorsal sepal. *Lip* deflexed from the base with a small globular sac at the base connected with the apical lobe by a long narrow untoothed claw; the apical lobe sub-rotund, divided by a shallow sinus into two broad lobules, the edges undulate and minutely crenulate or dentate, the interior of the sac with two large sub-quadrate crose lamellæ. *Column* and rostellar arms short. *Anther* broad, with a narrow pointed beak; *pollinia* sub-globose; the pseudo-caudicle large, broad, and composed of cohering imbricating scales without elastic threads; gland small, quadrate. *Stigmas* anticous and parallel. *Odontochilus crispus*, Hook. fil. Fl. Br. Ind. VI, 99; Hook. fil. Ic. Plant., t. 2164.

Sikkim, on Mahalderam peak, at an elevation of about 6,000 feet; in flower during September; Pantling No. 294. Khasia hills at 5,000 feet; Clarke.

The sepals are green, the petals and lip being white, the latter tinged with yellow on the sac. This has the toothless lip-claw of *Zeuxine* conjoined with the pseudo-caudicular pollinia and twisted rostellum so characteristic of *Anœctochilus*.

PLATE 395.—*Anœctochilus crispus*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 floral bract, ovary, column and base of lip, 3 the petals, 4 apex of ovary, and front of column, showing the two contiguous anticous stigmas (*s*), 5 interior of the sac of the lip, showing the calli in the interior, 6 anther, 7 pollinia; *all enlarged*.

7. ANŒCTOCHILUS TORTUS, King and Pantling.

Whole plant 6 or 7 in. high. *Stem* decumbent at the base, stout, bearing four or five leaves. *Leaves* green, 3-nerved, ovate to ovate-lanceolate, acute, slightly oblique, narrowed at the base into the channelled sheathing petiole; length about 2 in., breadth ·75 to 1 in.; petiole ·75 in. Peduncle of the raceme pubescent and bearing a solitary acuminate pubescent bract. *Spike* about 1·5 in. long, 3- to 6-flowered; *floral bract* lanceolate, acuminate, thinly pubescent, equalling the ovary. *Flowers* ·75 in. long. Dorsal *sepal* broadly ovate, concave, forming with the petals a hood over the column; the lateral pair oblong. blunt and spreading, all pubescent outside. *Petals* falcately rhomboid, sub-acuminate. *Lip* with a short sub-globose saccate base, a long toothed claw, and a much twisted apical lobe deeply divided into two sub-quadrate slightly divergent irregularly crenate lobules the upper margins of which are connivent; the sac containing two approximate stout up-turned teeth; the claw with nine unequal teeth on each margin. *Column* with two small approximate up-turned teeth below the entire anticous stigma; arms of the rostellum large, winged, bidentate. *Pollinia* in sub-equal pairs, united midway into a pseudo-caudicle; the gland small, ovate, lateral. *Odontochilus tortus*, King and Pantling in Journ. As. Soc. Beng. LXV, Pt. 2, 125.

Bhotan, at Kumai near the Jaldacca river, elevation about 4,000 feet; flowering in December; Pantling No. 354.

The nearest ally of this species is undoubtedly *O. Elwesii*, Clarke; but that species has very dark purple leaves, smaller than those of this and thicker in texture. *O. Elwesii* besides has a longer more pubescent peduncle than this which never bears more than three flowers. Moreover the lip of *O. Elwesii* is not twisted, and its claw has only seven pairs of teeth, while the sac of the lip is bilobed and the column has large processes. The colour of the sepals and petals of this is green, the lip being white and the anther pale brown.

PLATE 396.—*Anœctochilus tortus*.—King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 profile view of apex of ovary, column with anther *in situ*, and the saccate base of the lip, showing the polliniar gland (*g*) and one of the stigmas *s*), 3 front view of the column, showing the polliniar gland (*g*) and the stigma (*s*), 4 vertical section of the preceding, showing the callus on one side of the interior of the sac of the lip, 5 petals, 6 pollinia; *all enlarged*.

84. Cheirostylis, Blume.

Terrestrial herbs with stems decumbent and succulent at the base. *Leaves* membranous. *Flowers* few, racemose. *Sepals* united in their lower half into a ventricose tube. *Petals* shorter than the sepals. *Lip* saccate or cymbiform at the base, the sac with enclosed calli or setæ; the anterior lobe clawed, bilobulate or fimbriate. *Column*

short, with two long fleshy appendages in front, rostellum two-cleft. *Stigmas* two, lateral. *Anther* erect, its cells short; *pollinia* two, bipartite, inserted by a short caudicle on an oblong gland. Species about 12, Indian and Malayan.

1. Cheirostylis Griffithii, Lindl. in Journ. Linn. Soc. I, 188.

Whole plant 4 to 7 inches high. *Stem* succulent, decumbent below, glabrous, bearing some scarious sheaths. *Leaves* withered at flowering time, ovate, sub-acute, the bases cuneate; petioles short, expanding into wide hyaline sheaths; length of blade ·75 to 1 in., breadth ·5 to ·6 in. Peduncle as long as the stem but more slender, pubescent, and bearing several loose acuminate scarious sheaths more than ·5 in. long. *Flowers* one or two at the apex of the peduncle, ·75 in. long, (excluding the pubescent tumid ovary); *floral bract* lanceolate, acuminate, shorter or longer than the ovary. *Sepals* connate to the middle into a tube, pubescent especially towards the base; the free points acute, spreading. *Petals* narrowly oblong, falcate, acute, shorter than the sepals. *Lip* with an elongate concave base slightly saccate underneath its attachment to the column, the sac with two parallel rows of short glandular setæ within it; apical lobe of the lip orbicular, its edges coarsely fimbriate. *Column* elongate, with two linear erect processes equal in length to the spathulate arms of the rostellum and covering the gland of the pollinia. Hook. fil. Fl. Br. Ind. VI, 105. *Goodyera*, No. 9, Griff. Notul. III, 393.

Bhotan, on low hills near the Jaldacca river; elevation 4,000 feet; in flower during December; Pantling No. 353.

Khasia Hills; Lobb, Clarke. Burma, in Pegu; Kurz No. 355; in Tenasserim; Parish.

The flowers are pure white throughout.

Plate 397.—*Cheirostylis Griffithii*, Lindl. A plant, *of natural size*. Fig. 1 a flower, *side view*, 2 floral bract, ovary, column with anther *in situ*, lip and stigma (*s*), *seen from the side*, 3 lip, upper surface, 4 petals, 5 apex of ovary, column with its processes (*c p*), one of which is bent down to show its outline, gland of pollinia (*g*) and stigma (*s*), 6 empty anther, 7 pollinia and gland, *side view; all enlarged.*

85. Hetæria, Blume.

Terrestrial herbs with the characters of *Goodyera* but the flower everted so that the lip is superior. *Lip* adnate to the column. *Stigmas* two, lateral. Species about 13, Indian.

Hetæria rubens, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 603.

Whole plant 10 to 18 in. high, about half being leaf-bearing stem and glabrous; the rest peduncle, puberulous, and bearing a few scattered lanceolate acuminate sheaths with a terminal raceme. *Leaves* ovate to elliptic, somewhat oblique, sub-acute, 3 to 4·5 in. long and 1·75 to 2 in. broad, 5-nerved. *Raceme* 3 or 4 in. long, many-flowered, its rachis densely glandular-pubescent. *Flowers* ·3 in. long; *floral bract* lanceolate, acuminate, shorter than the glandular-tomentose cylindric ovary. *Sepals* broadly ovate. *Petals* hammer-shaped, clawed, gibbous on one side. *Lip* short, sub-hemispheric, with a small transverse, sometimes bifid, terminal lobe and a slightly carunculate callus on each side towards the base within. *Column* very short, with two small wings in front. *Anther* ovate-cordate, convex; *pollinia* clavate, pyriform, longitudinally grooved, attached by the short thin caudicle to the small sub-quadrate gland. Hook. fil. Fl.

Br. Ind. VI, 115. *Rhamphidia rubens*, Lind. in Journ. Linn. Soc. I, 182. *Cerochilus rubens*, Lindl. in Gard. Chron. 1854, 87. *Goodyera* No. 4, Griff. Notul. III, 390.

Sikkim, at elevations of from 1,500 to 3,000 feet, common; in flower during January and February; Pantling No. 202. Assam; G. Mann. Chittagong; Lister. Burma; Griffith (Kew Distrib. Nos. 5341 and 5342).

The sepals and petals are green tipped with pink, the lip green tipped with white, and the column yellowish-pink. The ovaries are of a dull dark purple, and the floral bracts of a pale bright purple or red. The leaves are green.

PLATE 399.—*Hetæria rubens*, Benth. A plant, *of natural size*. Fig. 1 floral bract, ovary and flower, 2 floral bract, ovary and column, showing the anther (*a*), stigma (*s*), and lip (*l*), 3 lip, 4 apex of column showing the polliniar gland (*p g*) and stigma (*s*), 5 pollinia, 6 a part of the peduncle showing the glandular hairs; *all enlarged*.

Tribe VI.—OPHRYDEAE.

Anther-cells sessile on the column, anticous or posticous, discrete or contiguous, but always distinct, parallel or diverging, often with tubes from their bases, each with a staminode on its outer surface; *pollinia* two, rarely four, usually with caudicles and always with glands; the glands naked or enclosed in the same pouch or in two distinct pouches. *Stigmas* two, distinct or conjoined below the anther-cells; pollen granular or sectile, not waxy.

Anther-cells anticous, lip with a single spur.

Flowers in spikes or racemes, small or mediocre; the sepals larger than the petals.

Lip with a long spur.

Flowers pink or purple, sometimes white; anther-cells without tubes; polliniar glands often in a pouch . . . *86. Orchis.*

Flowers green or yellowish-green, rarely white; anther-cells often with long tubes; polliniar glands naked (except in *H. pseudophrys*) . . . . . *87. Habenaria.*

Lip with no spur or with a very inconspicuous short sub-orbicular spur; flowers green; anther-cells with long tubes; polliniar glands naked . . . . . *88. Herminium.*

Flowers solitary, large; the sepals smaller than the petals . . . *89. Diplomeris.*

Anther-cells posticous or sub-anticous; lip with two spurs . . . . . *90. Satyrium.*

86. Orchis, Linn.

Terrestrial erect leafy herbs with oblong or digitately lobed tubers, or with fleshy fibrous roots. *Leaves* sheathing, not plicate. *Flowers* medium-sized, usually pink or purple, rarely white, not green, in spikes or racemes; the *floral bract* small, or foliaceous and exceeding the flower. *Sepals* sub-equal, the dorsal conniving to form a hood with the petals, the lateral pair spreading. *Petals* like the sepals or smaller. *Lip* adnate to the base of the column, spreading or pendulous, entire or 3-lobed, rarely 4- or 5-lobed, always spurred. *Column* very short. *Anther-cells* two, anticous, parallel, contiguous, without tubes; *pollinia* usually attached to caudicles; glands two, distinct or united,

lying in a common pouch, or naked. *Staminodes* rugulose, attached to the outer surfaces of the anther-cells or to the column by their sides. *Stigmas* united into a transverse band lying across the column for its whole breadth, or distinct and at the margins of the column (*O. habenarioides*). Species about 80; natives of Europe, temperate parts of Asia and Africa, also of Madagascar.

A genus very closely allied to *Herminium* and *Habenaria*, and senior to both in order of publication, seeing that the name was adopted from Tournefort by Linnæus; while *Herminium* originated with Linnæus, and *Habenaria* was not published by Willdenow until 1805. For convenience for study, and with the view of avoiding a formidable increase to the already almost insupportable burden of synonymy, we propose to leave the genera as they are. *Herminium* and *Habenaria* are at present kept out of *Orchis* by characters founded on the colour of their flowers, which is either green or greenish-yellow (white in a few species of *Habenaria*), while the flowers of *Orchis* are mostly pink or purple. In *Herminium* and *Habenaria* the anther-cells have tubes which are absent in *Orchis*. In other respects the characters of the three gerera are substantially the same. The minute saccate form of the spur (when a spur is present at all) serves to some extent as a character to keep *Herminium* distinct from *Orchis* and *Habenaria*, in both of which a spur is largely developed. In *Herminium* the glands of the pollinia are invariably naked, and in all the Indian species of *Habenaria* (with the solitary exception of *H. pseudophrys*) these glands are also naked; whereas, in the majority of the purple-flowered species ranked under *Orchis*, the two polliniar glands rest within a common pouch. *Ophrys* (also a Linnæan genus) is closely allied to *Orchis*, but is distinguished from the latter by the absence of a spur and also by the presence, on the upper surface of the convex lip, of calli and other processes of which there is no trace in the flat lip of *Orchis*. In three of the four species *of Orchis* described in this book the stigmas are united, but in *O. spathulata* they are distinct.

Stigmas distinct.
  Lip without side lobes.
    Apical lobe of lip rounded, entire . . . . . 1. *O. spathulata.*
Stigmas united.
  Apical lobe of lip with three shallow crenations . . . . . 2. *O. habenarioides.*
  Lip 3-lobed, the lobes sub-equal . . . . . 3. *O. Chusua.*
    Smaller in all its parts, the lobes much shallower . . . 3. „ (*var. nana*).
  Lip with large oblong truncate side lobes; the apical lobe with two truncate lobules almost as large as the side lobes . . . 4. *O. pulcrula.*

1. Orchis spathulata, Reichb. fil.

Whole plant 2 to 8 inches high. *Stem* proceeding from a thin rhizome, with one or two lax tubular blunt sheaths at its base. *Leaf* solitary from very near the base, (rarely a second from the middle of the stem) narrowly elliptic, blunt, tapering into a petiole of varying length; length of blade 1 to 3 in., breadth ·4 to 1 in., the petiole about the same length; stem above the leaf elongate, naked, slender, angled. *Spike* short, 1- to 4-flowered. *Flowers* nearly ·5 in. across (vertically); *floral bract* longer than the flower, foliaceous, lanceolate, sub-acute. *Sepals* unequal, the dorsal ovate, obtuse, conniving with the petals to form a hood; the lateral pair as long, oblong, sub-acute, spreading. *Petals* broadly elliptic, falcate, tapering slightly to the obtuse oblique apex, somewhat shorter than the sepals. *Lip* as long as the sepals, broadly elliptic, obtuse at base and apex, the edges sub-undulate; the upper surface slightly pubescent, with numerous shallow vertical grooves running from base to near the apex, and with a slightly thickened area in front of the entrance to the spur; spur about half as long as the ovary,

straight, vertical, cylindric, tapering slightly to the tip. *Pollinia* pyriform; the caudicles short, tapering; the glands elliptic, lying concealed in the rostellar pouch, or naked, (the rostellar pouch being rudimentary). *Staminodes* rather small, rugulose, broadly elliptic, lying opposite the bases of the anther-cells. *Stigmas* distinct, elliptic, widened at the lower end attached to the margins of the column interior to the staminodes. Hook. fil. Ic. Plantar., t. 2197A; Fl. Br. Ind. VI, 127. *Gymnadenia spathulata*, Lindl. Gen. and Spec. Orch. 280.

Sikkim, at Gnatong, elevation 11,000 feet; on the Sin-ga-le-la range, elevation 12,000 feet; in flower during July; Pantling Nos. 327 and 382. Lachung; Hooker, G. Gammie, Nos. 210, 776. Chumbi; King's Collectors. Gharwal-Himalaya; Duthie Nos. 194 and 515.

In this species the stigmas (unlike those of typical *Orchis*) are distinct and situate on the margins of the column, thus affording a connecting link with *Habenaria* in which distinct stigmas are common.

The colour of the flowers is white or purple. In some specimens the polliniar glands are covered by the single rostellar pouch characteristic of the genus *Orchis*; but in a large proportion of specimens the glands are practically naked, the rostellar pouch being quite rudimentary and lying behind and beneath the glands.

PLATE 400.—*Orchis spathulata*, Reichb. fil. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 ovary, column and lip, *in profile*, 3 lip, 4 the petals, 5 and 6 two views of the column—fig. 5 showing the lateral stigmas (*s*), the polliniar glands (*p g*) naked, (the rostella being very small, rudimentary, and lying below and behind the glands and not covering them in front); fig. 6 showing the polliniar glands in a single rostellar pouch (*r*), the lateral stigmas (*s*), and one of the staminodes (*s m*); the base of the lip (*l*) is also shown—7 pollinia; *all enlarged*.

2. ORCHIS HABENARIOIDES, King and Pantling.

Height of entire plant 12 to 20 inches. *Stems* clothed at the base with unequal tubular sub-acute wide-mouthed sheaths, tuber digitate. *Leaves* four or five, scattered along the stem, sessile, elliptic-oblong to linear-oblong, sub-acute, slightly narrowed to the rather long sheath; length 2 to 5 in., breadth ·75 to 1·25 in.; stem above the leaves short and bearing two or three lanceolate spreading bracts. *Spike* 1·5 to 2·5 in. long, densely-flowered, cylindric. *Flowers* ·25 in. across; *floral bract* herbaceous, lanceolate, acuminate, longer than the shortly-beaked curved ovary. *Sepals* sub-equal, puberulous, broadly ovate; the dorsal forming a hood with the petals; the lateral pair spreading, their apices acute and somewhat reflexed. *Petals* nearly as long as the sepals, obliquely ovate-rotund, cut away near the broad base at the inner side, the apex minutely apiculate. *Lip* broadly oblong, the base truncate and adnate to the base of the column, the apex broad with a very shallow central lobe, the upper surface quite smooth; spur as long as the ovary, curved, slightly clavate, laterally compressed, puberulous inside. *Column* short, broad. *Anther-cells* parallel, not far distant from each other; *pollinia* broadly elliptic, somewhat oblique, very obtuse at the apex; the caudicles short, stout, tapering, without pouches; glands oblong, the free ends truncate, the lower attached to the caudicle and embedded in the stigma. *Staminodes* large, sub-orbicular, rugulose, lying at the sides of the caudicles. *Stigmas* conjoined into a narrow band running beneath the orifice of the spur transversely from side to side of the column, and becoming wider opposite

that orifice. *Gymnadenia cylindrostachya*, Lindl. in Wall. Cat. 7056; Gen. and Spec. Orch., 278. *G. orchidis* and *G. violacea*, Lindl. Gen. and Spec. l. c. *Platanthera orchidis*, Lindl. in Wall. Cat. 7039A. *Habenaria orchidis*, Hook. fil. Fl. Br. Ind. VI, 142.

Sikkim, on the Sin-ga-le-la range and in the Lachong Valley. at elevations of about 12,000 feet; in flower during August; Pantling No. 404. Bhotan in the Chumbi Valley; King's Collector. Nepal; Wallich. Kashmir; Clarke No. 29239. Pangi; Stolickza.

The colour of the flowers is pinkish or violet, but occasionally they appear to be pure white. This plant is to some extent variable, and was described from imperfect herbarium material under three specific names by Lindley, but always under the genus *Gymnadenia*. It had originally been referred by him in Wallich's Catalogue (No. 7039) to *Platanthera*. But the latter genus was by Lindley himself finally considered as inseparable from *Gymnadenia*. In dealing, in the Flora of British India, with the three Himalayan species of *Gymnadenia* described by Lindley, Sir Joseph Hooker transfers *G. spathulata* and *G. Chusua* to *Orchis*, but he transfers *G. orchidis* (and the two which he reduces to it) to *Habenaria*, with the remark that, *as a Habenaria*, it forms a very anomalous member of the section (*Platyglossa*) where he places it. Believing that this plant is really more of an *Orchis* than of a *Habenaria*, we have ventured to transfer it to the former. We are keenly alive to the fact that the line of demarcation between the two genera is a very uncertain one; and we think it advisable to give considerable weight to the colour of the flower, which in this plant is pink or purple (the prevailing colour in *Orchis*), whereas in the undoubted Indian species of *Habenaria* the flowers are usually of some shade of green or of greenish-yellow, even white itself being uncommon.

PLATE 401.—*Orchis habenarioides*, King and Pantling. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 column showing the anther-cells, pollinia and their caudicles and glands (*p g*) *in situ*, staminodes (*s*), stigma (*b*), and mouth of spur (*c*), 3 petals, 4 lip, 5 section of spur, 6 pollinia; *all enlarged*.

3. ORCHIS CHUSUA, Don Prod. Fl. Nep. 23.

Entire plant from 4 to 10 in. high; *tuber* small, elliptic, entire. *Stem* with two unequal tubular blunt sheaths at the base. *Leaves* one or two, wide apart on the stem, narrowly oblong, acute, not narrowed to the sheathing base; length 1·5 to 3 in., breadth ·2 to ·3 in.; the second leaf, when present, much smaller than the first; stem above the leaves short, naked. *Spike* 1 to 1·75 in. long, 3- to 6-flowered, secund. *Flowers* ·6 in. to ·75 in. across (vertically); *floral bract* foliaceous, lanceolate, as long as the fusiform ovary *Sepals* oblong, blunt, the dorsal resting on the parallel petals; the lateral pair recurved. *Petals* broadly ovoid, dimidiate, sub-acute, the bases truncate. *Lip* deeply 3-lobed; the lobes equal, oblong, blunt, the lateral ones diverging; *spur* cylindric, slightly clavate, as long as and adpressed to the straight ovary. *Column* short. *Anther-cells* parallel, lying close together; *pollinia* ovoid-globose, narrowed very little to the long tapering caudicle; the glands small, ovate-oblique, each lying in a small pouch. *Staminodes* large, rugulose, ovate, pointed, attached outside the bases of the anther-cells. *Stigmas* conjoined into a large concave surface under the anther-cells. Hook. fil. Fl. Br. Ind. VI, 127. *Gymnadenia Chusua*, Lindl. in Wall. Cat. 7058; Gen. and Spec. Orch. 280. *G. puberula*, Lindl. in Wall. Cat. 7059.

Sikkim, at elevations of 10,000 to 13,000 feet; Hooker and others; on the Singa-le-la range and at Tallum Sam-dong in the Lachen valley, at similar elevations, Pantling No. 458; in flower during July and August. Nepal; Wallich. Kamaon; Duthie. Also in Eastern Tibet; M. Soulie No. 210.

The colour of the flowers is dark purple.

We have retained this plant in the genus *Orchis*, in spite of its having the separate pouch to each gland which is supposed to be characteristic of *Ophrys*, while in *Orchis* there is supposed to be only a single pouch for the two glands. In some species of *Orchis*, however, there is no pouch whatever; and in *O. spathulata*, Reichb. fil., specimens are common in which the pouch is developed, while in others it is so rudimentary as to leave the glands practically naked. The character founded on a pouch appears thus to be untrustworthy. We prefer, therefore, to give more weight to characters derived from structures other than those we would otherwise have relied upon and to put this plant into *Orchis* rather than into *Ophrys*, because (*a*) of the presence of a well-developed spur equalling the ovary in length [there being no spur whatever in typical *Ophrys*, and only a very short one in a single species (*O. tabanifera*, Willd.), which has been referred to that genus]; (*b*) of the entire absence of calli or other appendages on the flat lip (the lip of *Ophrys* being usually convex with reflexed margins, and bearing calli or other processes on its upper surface); (*c*) of the total absence of hairs on all parts of the flower (the petals and lip of many species of *Ophrys* being pubescent); and, finally, because of the absence in the column of this plant of an apical process to the clinandrium. The specimen figured on Plate 400 represents a large form of the species which is quite common. Growing side by side with it is a dwarf form which, except in size, differs little from the larger one. Between the two there are numerous gradations. To this dwarf form we have given the varietal name *nana*, and of it we also give a figure.

Var. *nana*. Whole plant 2 to 3 in. high; differing from the larger form in its much smaller size, in having only a single leaf, in the middle lobe of the lip being less deeply lobed, and in the spur being somewhat compressed. Pantling No. 326.

PLATE 402.—*Orchis Chusua*, Don. Two plants, *of natural size*. Fig. 1 a flower, *front view*, 2 bract, ovary, column and lip, *seen from the side*, 3 the petals, 4 section of spur, 5 apex of ovary and column, showing the anther cells with the receptacles of the glands of the pollinia (*r*), the staminodes and the stigma (*s*), 6 pollinia; *all enlarged*.

PLATE 402 *bis*.—*Orchis Chusua*, Don, var. *nana*, King and Pantling. Three entire plants, *of natural size*. Fig. 1 a flower, *front view*, 2 side view of ovary, column, spur and lip, 3 petals, 4 section of spur, 5 column showing the anther, pouched rostellum (*r*) and stigma (*s*), 6 pollinia—*all enlarged*; 7 tuber at base of stem; *of natural size*.

4. ORCHIS PUBERULA, *new species*.

Whole plant not more than six inches high, slender. *Leaf* solitary, linear, acute, not tapered to the base, 2 to 3 in. long and about ·12 in. broad. *Spike* terminal, peduncled, 2- to 3-flowered. *Flowers* two or three, about ·35 in. long; *bract* lanceolate, half as long as the stalked ovary. *Sepals* strongly keeled, puberulous externally; all (but especially the ovate dorsal one) concave; the lateral pair narrower than the dorsal. *Petals* lanceolate, falcate, sub-acuminate, not united into a hood with the

dorsal. *Lip* about twice as long as the sepals, much decurved, the lateral lobes broadly oblong with truncate apices; the terminal lobe divided into two truncate lobules almost as large as the side lobes; the whole upper surface puberulous; *spur* half as long as and lying parallel to the ovary, cylindric, sub-acute. *Anther* with parallel cells; *pollinia* sub-obovoid, the caudicles clavate; the glands small, nearly naked, their lower halves being only partly covered by the small tongue-like rostellar pouch. *Staminodes* elongate.

Sikkim, in the Lachong valley, at 10,000 feet; flowering in July; Pantling No. 478.

This species resembles the small forms of *O. Chusua*, Don, but has puberulous strongly-keeled sepals and a very puberulous practically 4-lobed lip; the flowers are white.

PLATE 403.—*Orchis puberula*, King and Pantling. Three plants, *of natural size.* Fig. 1 side view of a bract, ovary and flower, 2 lip, 3 column, showing the anthers and almost naked polliniar glands, the staminodes and the stigma (*s*), 4 pollinia; *all enlarged.*

87. Habenaria, Willd.

Terrestrial leafy herbs with undivided or lobed tubers or fleshy root-fibres. *Leaves* not plaited, their bases sheathing. *Flowers* in racemes or spikes. *Sepals* sub-equal, the dorsal often connivent with the petals to form a hood over the column; the lateral pair spreading, reflexed or deflexed, or sometimes erect. *Petals* smaller or larger than the sepals, entire or 2-cleft. *Lip* adnate to the base of the column, entire, 3-lobed or 3-partite, its base spurred. *Anther-cells* adnate to the front of the short usually broad column, discrete, rarely touching, parallel or divergent below, their bases often prolonged into tubes containing the caudicles. *Staminodes* rugulose, lying one on the outer side of each anther-cell. *Pollinia* two, clavate or pyriform, usually grooved, sometimes 2-partite; caudicles long, short or absent; glands exposed, flat and discoid, or elliptic or globular, or elongate with truncate ends [conjoined and overlapped by processes of the rostellum (?) in *H. secundiflora*]. *Stigmas* two, distant from each other or conjoined to form a belt across the face of the column. Species about 400; cosmopolitan, temperate and tropical.

A genus which should certainly be reduced to the older Linnæan genus of *Herminium* were it not for the upsetting of synonymy which this would involve. The older genus consists of about 13 species; *Habenaria* contains about 400! Moreover the distinctions between *Habenaria* and *Orchis* are also mostly arbitrary; and, were mere consistency the only object, *Orchis* (a genus of Tournefort) would swallow up not only *Herminium* and *Habenaria*, but also *Diplomeris* and *Hemipilia*. Genera are after all little more than conveniences for facilitating study, and there seems no necessity for applying the Draconian principles of Kuntze at the expense of much discomfort to the students of this beautiful family. We have arranged the species in the sections adopted by Sir J. D. Hooker in his admirable account of the genus in the *Flora of British India*.

Sect. I.—ATE.—Petals bipartite; lip 3-lobed or 3-partite.

Lip hastately 3-partite, the lower lobe of the petals short . . . *1. H. stenopetala.*

Segments of the lip and of the sepals filiform, and the apices of all the sepals with long filiform tails . . . . . *1. H. stenopetala,* var. *polytricha.*

Sect. II.—Platyglossa.—Petals entire. Lip 3-lobed or 3-partite, the side lobes broad, the apical lobes narrow.

Side lobes of lip cuneate or rounded, the edges fimbriate or crenate . . . . . 2. *H. geniculata.*

Side lobes of the lip deeply pectinate.

Leaves linear-lanceolate, acuminate; sepals unequal, the lateral pair erect, with recurved apices; petals narrowly oblong, falcate, ciliate, not dilated at the base; spur slightly longer than the ovary . . . . . 3. *H. pectinata.*

Leaves narrowly elliptic; sepals narrowly elliptic-oblong; the lateral pair sub-falcate, horizontal, ciliolate; petals much dilated at the base on the outer side, the inner surface pubescent; spur much longer than the ovary . 4. *H. aristina.*

Sect. III.—Trimeroglossa.—Petals entire. Lip 3-partite, the side-lobes very narrow, usually filiform.

Stigmas conjoined beneath the orifice of the spur, obovoid with a bifid apex . . . . . 5. *H. Aitchisoni.*

Stigmas separated from each other and lying at the sides of or above the entrance to the spur.

Lip hastately 3-partite, the side lobes horizontal; spur shorter than the sepals and much shorter than the ovary, clavate or fusiform . . . . . 6. *H. aristata.*

Segments of the lip all pointing forwards, the lateral diverging, curved, longer than the stouter straight middle segment; spur very slender, not clavate or bulbous, much longer than the ovary . . . . . 7. *H. furcifera.*

Segments of the lip all pointing forwards, the lateral shorter than the flexuose central segment; spur half as long as the ovary, its apex globose or clavate . . . . . 8. *H. malleifera.*

Sect. IV.—Hologlossa.—Petals entire. Lip narrow, entire or with minute basal lobes.

* Stigmas conjoined, but not forming a band across the column.

Staminodes much shorter than the anther-cells; pollinia grooved but not divided; flowers not secund.

Conjoined stigmas forming a small transversely elliptic body situated between the polliniar glands and above the orifice of the spur; lip lanceolate, 3-nerved, quite entire . . . 9. *H. stenantha.*

Conjoined stigmas forming an elliptic rotund vertically grooved mass below the orifice of the spur; staminodes obovoid, transverse . . . . . 10. *H. Bakeriana.*

Conjoined stigmas forming a large globose mass above the orifice of the spur; staminodes ovoid-globose . . . . 11. *H. juncea.*

Staminodes as long as the anther-cells and parallel with them; pollinia divided to the base; stigma forming an entire ovate area situated immediately below the polliniar glands . . . . 12. *H. urceolata.*

** Conjoined stigmas forming a band extending across the whole breadth of the column.

Pollinia without caudicles; sepals and petals connivent . . . 13. *H. nematocaulon.*

Pollinia with long caudicles; lip narrowly oblong, tapering, acuminate.

Lip not bent near the apex; lateral sepals much convolute, reflexed; floral bracts much longer than the flower, recurved . . . . . *14. H. Sikkimensis.*

Lip bent just below the apex; lateral sepals reflexed but not convolute; floral bracts not much longer than the flower, not decurved . . . . . *15. H. Dyeriana.*

*** Stigmas two, quite distinct.

Spur shorter than the sepals and much shorter than the ovary. . . . . .

Lip oblong-lanceolate, deflexed from the base, blunt, fleshy, with two minute horizontal side lobes near the base; spur compressed from front to back; sepals and petals all connivent to form a hood . . . . . *16. H. Biermanniana.*

Lip linear, obtuse, straight, with a transverse callus on the upper surface near the base, but with no side lobes; spur laterally compressed; lateral sepals reflexed . . *17. H. densa.*

Spur much longer than the sepals and also longer than the ovary. . . . . .

Pollinia sessile on a long narrow gland truncate at each end.

Leaves two, narrowly elliptic, acute; lip fleshy, oblong-lanceolate, deflexed; staminodes smooth, ovate, falcate, pointed; stigmas broadly oblong, curved, situated at the sides of the orifice of the spur . . . . . *18. H. leptocaulon.*

Leaf solitary, oblong-oblanceolate, blunt; lip lanceolate, not deflexed; staminodes large, globose, rugulose; stigmas orbicular-ovoid projecting . . . . . *19. H. oligantha.*

Pollinia with caudicles and small elliptic or elliptic-rotund glands.

Lip tapering slightly to the apex, almost terete; petals bluntly caudate-acuminate . . . . . *20. H. latelabris.*

Lip fleshy, cylindric; petals bluntly acuminate, not caudate . . . . . *21. H. Cumminsiana.*

Sect. V.—Peristylus.—Petals entire, sometimes broader than the lateral sepals, and often fleshy; lip little or sometimes not at all longer than the sepals, 3-lobed in its anterior half; spur shorter than the sepals and much shorter than the ovary, often wide or globular.

Stigmas conjoined into a narrow reniform horizontal band; spur horizontal, cylindric . . . . . *22. H. albo-marginata.*

Stigmas distinct.

Leaves several.

Spur fusiform, lateral sepals spreading . . . . . *23. H. Parishii.*

Spur ovoid, constricted at the neck; lateral sepals pointed upwards . . . . . *24. H. tentaculata.*

Leaf solitary.
Spur sub-cylindric, 2-ribbed inside; lateral sepals pointed upwards . . . . . 25. *H. fallax.*
Spur globular.
Flowers ·75 in. across at the mouth . . . . . 26. *H. constricta.*
Flowers not exceeding ·35 in. across at the mouth.
Lip flat, not gibbous at the base, but with a shallow basal concavity on its nearly flat upper surface; flowers about ·35 in. across . . . . 27. *H. goodyeroides.*
Lip gibbous at the base and with a horizontally oblong callus near its base; flowers scarcely ·25 in. in diam. . . . . 27. *H. goodyeroides,* var. *affinis.*
Lip concave, without any calli; flowers about ·15 in. across.
Anthers not at all covered by the side-wings of the column; polliniar glands not in pouches . . . . . 28. *H. Prainii.*
Anthers partly covered by the side-wings of the column; each of the polliniar glands in a pouch . . . . . 29. *H. pseudophrys.*

Sect. VI.—Diplla.—Glands of pollinia conjoined into a single body, bifid at each end and covered by two flaps of tissue; flowers secund . . . . . 30. *H. secundiflora.*

1. Habenaria stenopetala, Lindl. Gen. and Spec. Orch., 324.

Height of the whole plant one to three and a half feet; basal third of the stem clothed with closely-fitting sheaths. *Leaves* distributed over the upper two-thirds of the stem, membranous, oblong-lanceolate or ovate-lanceolate, acute, the edges undulate, the base usually broad (rarely narrowed) amplexicaul or sheathing, sessile; length 3 to 8 in., breadth 1·25 to 2·75 in.; the part of the stem above the leaves and below the raceme with lanceolate acuminate bract-like leaves much smaller than those of the middle-stem. *Raceme* 4 to 9 in. long, crowded. *Flowers* about 1 in. in diam.; *floral bract* lanceolate, acuminate, about as long as the slender stalked ovary. *Sepals* subequal, oblong-lanceolate, acuminate, spreading or reflexed. *Petals* shorter than the sepals, linear, produced as a wing downwards a little below the point of insertion *Lip* as long as the petals, hastately 3-partite; the segments narrow, fleshy, the central segment horizontal, the basal pair sometimes as long as the central, but usually shorter; *spur* as long as the stalked ovary, slender, vertically compressed, 2-ridged, up-turned. *Column* stout. *Anther-cells* rather distant, parallel, narrow, erect, their tubes long; *pollinia* oblong, their caudicles slender and twice as long as themselves, the glands minute. *Staminodes* ovate, rugulose, situated externally to the anther-cell and stigma on each side. *Stigmas* two, oblong, with slightly divergent blunt apices, situated below the anthers and at the margins of the mouth of the spur. *Capsule* linear-oblong. Hook. fil. Fl. Br. Ind. VI, 134; Ann. Bot. Gard. Calc. V, t. 95; Kräntzlin in Engl. Bot. Jahrb., XVI, 162.

Sikkim, at elevations of from 2,000 to 6,000 feet; in flower from August to October; Pantling No. 57. Westward to Gharwal. Upper Assam, Bengal.

The colour of the lip is brown, but that of the other pieces of the perianth is pale green.

Var. POLYTRICHA, Hook. fil. Ann. Bot. Gard. Calc. V, 64, t. 96. *Spikes* short (2 to 3 in. long). *Sepals* and *petals* produced into long capillary tails; the dorsal sepal 1·25 in. long, its base gibbous, its long tail curving over the column; the lateral pair shorter, deflexed on the ovary, their tails up-turned. *Petals* each consisting of two capillary segments of about equal length, one ascending, the other descending, and both flexuose. *Lip* of three curved deflexed segments like those of the petals; the compressed spur triangular in section.

Sikkim, at elevations of about 5,000 feet; in flower during August and September; Pantling No. 415.

The flowers are pale green in colour in all their parts.

PLATE 404.—*Habenaria stenopetala*, Lindl. Part of a plant, *of natural size;* an entire plant, *reduced in size.* Fig. 1 a flower, the basal lobe of a petal (*p*), 2 apex of ovary and column, showing the rostellum (*r*), pollen glands (*p g*), stigma (*s*), the mouth of the spur (*g*), 3 petals, 4 lip, 5 section of spur, 6 pollinia; *all enlarged.*

PLATE 404 *bis.*—*Habenaria stenopetala*, Lindl., var. *polytricha*, Hook. fil. Parts of a plant, *of natural size.* Fig. 1 a flower and its bract, 2 apex of ovary, column showing the 2-lobed stigma (*s*) (the pollinia absent), 3 the petals, 4 section of the spur, 5 pollinia; *all enlarged.*

2. HABENARIA GENICULATA, Don Prodr., 25.

Height of plant 12 to 30 in. *Tubers* ellipsoid, pubescent. Lower part of *stem* sheathed, middle part leafy, upper part bracteate. *Leaves* oblong-elliptic, acute, 5- to 7-nerved, the base narrowed into a long tubular sheath; length 2 to 4·5 in.; the bracts lanceolate, acuminate, becoming narrower upwards, 1·5 to 1 in. long. *Spike* 2 to 4 in. long, rather laxly-flowered. *Flowers* ·8 to 1 in. across; *floral bract* lanceolate, acuminate, as long as the shortly beaked fusiform ribbed ovary. *Sepals* sub-equal, broadly ovate, acute, spreading, the lateral pair sub-erect. *Petals* narrowly oblong, sub-acute, curved inwards, shorter than the sepals. *Lip* as long as the sepals, variable in breadth, sub-orbicular or broadly obcordate, with large cuneate or rounded, fimbriate or crenate side lobes, and a small, much shorter, oblong entire apical lobe; *spur* infundibuliform at the base, slender, laterally compressed, geniculate, sub-clavate below the knee, longer than the shortly-stalked beaked ovary. *Anther-cells* broad, distant, divaricate, their tubes elongated and curved inwards. *Staminodes* sub-globular, tuberculate, situated on the sides of the anther. *Pollinia* two, broadly ovate in general outline, compressed, each consisting of two thin granular plates attached to a stout incurved caudicle triquetous above and tapering to the small hemispheric gland. *Stigmas* two, sub-cylindric-clavate, falcate, rather blunt, the entrance to the spur lying between their bases; infertile stigma forming a low broad fleshy arch between the anther-cells. *Capsule* shortly pedicelled, fusiform, ribbed, the apex beaked, 1 in. long. Lindl. Gen. and Spec. Orch. 324; Hook. fil. Fl. Br. Ind. VI, 138; in Ann. Roy. Bot. Gard. Calc. V, 65, t. 98; Kräntzlin in Engl. Bot. Jahrb. XVI, 198. *Platanthera geniculata*, Lindl.

in Wall. Cat. 7042. *Habenaria*, Griff. Notul. III, 406; Itin. Notes 31, No. 495; Ic. Pl. Asiat., t. 340.

Sikkim, at elevations of from 2,500 to 5,000 feet, common; Pantling No. 97. Westward to Nepal. Also in the Khasia and Naga Hills, and in Burma.

The flowers of this are white and the bracts green. The pollinia, as has been above indicated, are composed of two thin flat granular plates (of pollen masses) so closely adherent to each other that it is impossible to detach the one plate from the other. Kräntzlin (Engl. Bot. Jahrb. XVI, 199) reduces to this *Platanthera dentata*, Lindl. Gen. and Spec. Orch., 296. (*Orchis dentata*, Swartz Act. Holm. 1800, p. 207; Willd. Sp. Pl., Vol. IV, 42.)

Mr. Pantling, who has collected this species very largely, finds that a form of it with spurless flowers is very common (see Figs. 4 and 5 of the plate). The flowers of this form have moreover an entire lanceolate lip, as though the side lobes on a lip of the usual form had been removed. The two stigmas in this variety are also united, whereas in the normal flower they are separated by the area in the centre of which lies the orifice of the spur. Except for these differences the plant in every way resembles the typical form.

Var. ECALCARATA. Spurless; stigmas united; *lip* lanceolate-oblong.

PLATE 405.—*Habenaria geniculata*, Don. Parts of a plant, *of natural size*. Fig. 1, column showing the pollen chambers and their staminodes, rostellum, stigmas (*s*) and mouth of the spur, 2 section of spur, 3 pollinia, 4 flower of var. *ecalcarata*, showing the oblong, lanceolate lip (*l*), and united stigmas (*s*), 5 floral bract, ovary and remains of the flower of the spurless variety; *all enlarged*.

3. HABENARIA PECTINATA, Don Prod. Fl. Nep., 24.

Whole plant 12 to 30 in.; lower part of *stem* stout and bearing long tubular clasping sheaths with acute apices. *Leaves* distributed in the upper part of the stem, sessile, linear-lanceolate, acuminate, strongly 3-nerved, the bases broad and sheathing or stem-clasping; length 4 to 7 in., breadth at the middle ·5 to ·8 in.; those nearest to the raceme much smaller. *Raceme* 3 to 6 in. long. *Flowers* 1·25 to 1·5 in. in diam.; *floral bract* linear-lanceolate, longer than the sub-sessile ovary. *Sepals* unequal; the dorsal lanceolate, erect, the lateral pair rather wider, sub-falcate, acute, erect, with recurved apices. *Petals* forming a hood with the dorsal sepal, narrowly oblong, falcate, acute or obtuse, the outer margins shortly ciliolate. *Lip* as long as the sepals, deeply 3-lobed; the middle lobe linear; the side-lobes rather longer, deeply pectinate on the outer margin; *spur* laterally compressed, rather longer than the ovary, sigmoid or geniculate, dilated at the apex. *Anther-cells* divergent, their lobes very long; *pollinia* narrowly elliptic, grooved, their caudicles as long as themselves, slender, curved, the glands discoid, minute. *Stigmas* linear, divergent, situated on the sides of two thin elongate distant sub-horizontal processes. *Capsule* almost sessile, fusiform, thickly ribbed. Wall. Cat., 7029 A. and B. *in part;* Lindl. Gen. and Spec. Orch., 321; Hook. fil. Fl. Br. Ind. VI, 137. *H. pectinata* and *H. arietina*, Hook. fil., Kräntzlin in Engl. Bot. Jahrb. XVI, 193. *H. Gerardiana*, Wall. Cat., 7031. *H. ensifolia*, Lindl. in Wall. Cat. 7030; Lindl. Gen. and Spec. Orch., 321. *Orchis pectinata*, Smith Exot. Bot., t. 99.

The dorsal sepal and petals are greenish-white, the lateral sepals dark green, and the lip white.

Sikkim, at Namgah, elevation 5,000 feet; in flower during August; Pantling No. 177. Westwards along the range to Simla, at elevations of 5,000 to 8,000 feet. Khasia Hills.

PLATE 406.—*Habenaria pectinata*, Don. Parts of a plant, *of natural size.* Fig. 1 a flower, 2 apex of ovary and column, showing the stigmas (*s*), anther with its elongated processes, and the mouth of the spur (*c*), 3 the petals, 4 section of spur, 5 pollinia; *all enlarged.*

4. HABENARIA ARIETINA, Hook. fil. Fl. Br. Ind. VI, 138.

Habit and general appearance of *H. pectinata*, but the leaves much broader, narrowly elliptic, acute or shortly acuminate; the *raceme* 5 to 8 in. long. *Sepals* narrowly oblong-elliptic; the lateral pair sub-falcate, ciliolate. *Petals* much dilated at the base externally, bluntly acuminate, puberulous, erect and adpressed to the dorsal sepal. *Lip* as in *H. pectinata*, but the side lobes with fewer teeth; *spur* laterally compressed, much longer than the ovary; *pollinia* broader than in *H. pectinata*, and more distinctly grooved. Hook. fil. in Ann. Bot. Gard. Calc. V, 64, t. 97. *H. pectinata*, Lindl. (*not of Wallich*) Gen. and Spec. Orch. 341; Wall. Cat. 7029, B. (*in part*) and C.

Sikkim, at Tumlong above Pemiongchi, Re-chi-la; at elevations of 6,000 to 9,000 feet; in flower during July and August; Pantling No. 333. Westward along the range to Simla. Khasia Hills, at elevations from 5,000 to 6,000 feet.

The flowers of this are green throughout. As in the case of *H. pectinata*, specimens dry black, and the two species are so similar that Wallich issued both under the same number (7029); while Lindley, in describing *H. pectinata* in his Genera and Species of Orchids, gave, as has been pointed out by Sir Joseph Hooker in his Flora of British India, Don's name *pectinata* to the wrong plant. Kräntzlin does not admit this as a species, but reduces it to *H. pectinata*.

PLATE 407.—*Habenaria arietina*, Hook. fil. Part of a plant, *of natural size.* Fig. 1 a flower, 2 column showing the anthers, staminodes, and stigmas (*s*), 3 section of spur, 4 pollinia; *all enlarged.*

5. HABENARIA AITCHISONI, Reichb. fil. in Trans. Linn. Soc., Ser. 2, Bot. III, 114; Boiss. Fl. Orient. Suppl. 370, var. *Josephi*, Hook. fil. Fl. Br. Ind. VI, 152.

Height of the whole plant about 5 in.; *tuber* large, irregularly ellipsoid, hairy. *Leaves* two, sessile, orbicular, cuspidate, opposite and rising about 1 in. from the base of the stem. Peduncle glandular-pubescent, longer than the stem or the raceme, ebracteate. *Raceme* 1·5 to 2 in. long, 4- to 6-flowered, the rachis glandular-pubescent. *Flower* ·65 in. in diam.; *floral bract* linear-lanceolate, shorter than the slender-stalked glandulose ovary. *Sepals* sub-equal; the dorsal ovate, acute, forming a hood with the broadly lanceolate acuminate *petals;* lateral sepals wide-spreading, acute. *Lip* divided to the base into three linear lobes, the middle one straight, the lateral pair longer and with recurved tips; *spur* curved forward, clavate towards the apex, as long as the short curved ovary. *Column* short, stout. *Anther-cells* parallel, separated from each other by an area with the mouth of the spur in the middle; *pollinia* globular-ovoid; the

caudicles short, rather stout; the glands large, thick, discoid, lying close under the mouth of the spur; *staminodes* elongate, lying at the side of the anther. *Stigmas* united below the mouth of the spur, obovoid with a bifid apex; infertile stigma forming a thickened rim above the mouth of the spur. Hook. fil. Fl. Br. Ind. VI, 152; Kräntzlin in Engl. Bot. Jahrb. XVI, 154. *H. brachyphylla*, Aitch. and Hemsl. in Journ. Linn. Soc. XIX, 118 (*not of Kräntzlin*). *H. Josephi*, Reichb. fil. in Trans. Linn. Soc. l. c. 114.

Sikkim, in the Lachen Valley, at elevations of 10,000 to 11,000 feet; in flower during July; Pantling No. 398. Westward to Kashmir, at rather lower elevations. Also in Affghanistan, Kuram Valley.

The colour of the flowers is greenish.

PLATE 408.—*Habenaria Aitchisoni*, Reichb. fil., var. Josephi, Hook. fil. A plant, *of natural size.* Fig. 1 a flower with part of its ovary, 2 floral bract, ovary, column and lip with its spur, *in profile*, 3 the petals, 4 section of spur near the tip, 5 front view of the column, showing the base of the lip, the conjoined stigmas (*s*), the staminodes (*b*), the glands of the pollinia (*p g*), and the mouth of the spur (*c*), 6 front and side views of pollinia and their appendages; *all enlarged.*

6. HABENARIA ARISTATA, Hook. fil. Fl. Br. Ind. VI, 158.

Whole plant 12 to 20 in. high, tubers oblong. *Stem* very slender, with many clasping blunt sheaths in its lower fourth, its next fourth leafy and the upper half bracteate. *Leaves* three to five, unequal, the middle ones the largest, elliptic-lanceolate, acute, slightly narrowed to the shortly-sheathed base; length 2 to 4 in., breadth ·5 to ·75 in.; bracts tubular, lanceolate, acute, diminishing in size upwards, 1·5 to ·5 in. long. *Spike* narrow, 2 to 8 in. long, many- but laxly-flowered. *Flowers* about ·5 in. in diam. at the mouth; *floral bract* broadly lanceolate, acuminate, as long as the erect sessile shortly-beaked ovary. *Sepals* sub-equal, linear, obtuse; the lateral pair turned upwards and slightly spreading. *Petals* conniving with the dorsal sepal to form a hood, falcately ovate-lanceolate, sub-acute, their bases oblique. *Lip* slightly longer than the sepals, hastately tripartite; the middle segment linear, obtuse, shorter than the filiform lateral horizontally spreading lobes; *spur* variable, shorter than the sepals and much shorter than the ovary, clavate or fusiform, curved. *Column* very short, depressed. *Anther-cells* small, parallel, tubes none; *pollinia* small, obovoid, longer than the oblique caudicles; gland sub-rotund, minute. *Stigmas* two, narrowly oblong, situate at the sides of the mouth of the spur; *staminodes* on the ridges above the stigmas. *Capsule* fusiform. *Peristylus aristatus*, Lindl. Gen. and Spec. Orch. 300; Thwaites' Enum. Pl. Ceyl. 310 (*in part, excl. syn.*). *P. exilis*, Wight Ic., t. 1693.

Sikkim, at Labba, Choongthang, Tumlong and Pashating; elevations 6,000 to 7,000 feet; in flower during August; Pantling No. 176. Khasia Hills, at elevations of 4,000 to 5,000 feet; Hooker and Thomson. Ceylon, at Newera Elia, elevation 6,000 feet; Thwaites.

The colour is green throughout.

PLATE 409.—*Habenaria aristata*, Hook. fil. A plant, *of natural size.* Fig. 1, floral bract, ovary and flower, 2 column showing the back of the anther and the stigmas (*s*), 3 the petals, 4 section of the spur, 5 pollinia; *all enlarged.*

7. HABENARIA FURCIFERA, Lindl. Gen. and Spec. Orch, 319.

Whole plant 10 to 18 inches high. *Stem* sheathing near the base, the leaves crowded below the middle, the upper part bracteate. *Leaves* narrowly elliptic, acute, slightly narrowed to the sheathing base; length 2·5 to 4·5 in., breadth ·9 to 1·35 in.; bracts lanceolate, acuminate, diminishing upward, 1·2 to ·8 in. long. *Raceme* 5 to 7 in. long, many- but laxly-flowered. *Flowers* ·5 in. in diam. (from base to apex); *floral bract* linear-lanceolate, acuminate, scarcely so long as the shortly-stalked ovary. *Sepals* unequal; the dorsal concave, ovate-oblong, obtuse; the lateral pair rather shorter, broadly lanceolate, somewhat falcate, acute or acuminate, spreading. *Petals* as long as the dorsal sepal, oblong, slightly retuse, forming with the dorsal sepal a hood over the column. *Lip* longer than the sepals, divided to the base into three segments; the lateral segments filiform, curved, diverging, longer than the stouter blunt middle one; *spur* longer than the ovary, very slender, laterally compressed, curved towards the apex. *Anther-cells* touching, their tubes rather short, diverging; *pollinia* falcately ovoid, almost as long as their slender slightly-curved caudicles; glands narrowly oblong; *staminodes* rather large, broadly oblong, situated at the side below the anther-cells. *Stigmas* two elliptic, blunt, one at each side of the entrance to the spur, the infertile stigma forming a thickened rim at the upper part of that orifice. *Capsule* fusiform, turgid, decurved, with thick ribs and a short beak. Hook. fil. Fl. Br. Ind. VI, 149; Kräntzlin in Engl. Bot. Jahrb. XVI, 161. *H. hamigera*, Griff. in Calc. Journ. Nat. Hist. IV, 380, t. 20. *H. tenuicornis*, Wall. MSS.

Sikkim, below Mim, at an elevation of about 3,000 feet; in flower during July and August; Pantling No. 335. Westward to Gharwal. Also in Bhotan, Assam, Eastern Bengal and Orissa.

The colour of the flower is green.

PLATE 410.—*Habenaria furcifera*, Lindl. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 column showing the stigmas (*s*), glands of pollinia (*p g*), rostellum (*r*), callus overhanging the entrance to the spur (*c*), 3 lip, 4 the petals, 5 section of the spur near the lip, 6 pollinia; *all enlarged*.

8. HABENARIA MALLEIFERA, Hook. fil. Fl. Br. Ind. VI, 143.

Whole plant 15 to 24 in. high. *Stem* sheathed in its lower fourth; the second fourth leaf-bearing; the upper part bracteate, triquetrous, the angles fimbriate. *Leaves* narrowly elliptic, acute or sub-acute, the base narrowed to the wide short sheath; bracts lanceolate, acuminate, diminishing in size upwards, 2·5 to 1·25 in. long. *Spike* 4 to 10 in. long, lax, tristichous, its rachis ribbed and with flattened laciniate hair like processes on the edges. Flowers about ·6 in. in diam.; *floral bract* broadly lanceolate, shortly acuminate, equalling or exceeding in length the sessile beaked ovary, ciliolate; ovary ciliolate on the ridges; its beak long, slender. *Sepals* unequal; the dorsal orbicular, hooded, incumbent on the column; the lateral pair larger, gibbously triangular, oblong, blunt, reflexed. *Petals* much smaller, triangular, sub-acute. *Lip* longer than the sepals, divided to the base into three filiform segments, the middle one usually the longest and the most flexuose. *Spur* about half as long as the ovary, bent from the middle, its apex globose or clavate. *Column* very short. *Anther* recumbent, with very long spreading tubes, the *staminodes* adnate to its sides; *pollinia* sub-elliptic, grooved, the

caudicles long, straight, triquetrous, dilated at the apex and each ending below in a minute ovate gland. *Stigmas* two, elliptic-globose, lying close together above the entrance to the spur. Kräntzlin in Engl. Bot. Jahrb. XVI, 168.

Sikkim, at elevations of about 5,000 or 6,000 feet; in flower during August and September; King, Pantling No. 182. Khasia Hills at 5,000 feet; Lobb, Hooker *filius* and Thomson.

The flowers are pale green.

PLATE 411.—*Habenaria malleifera*, Hook. fil. Parts of an entire plant; *of natural size.* Fig. 1, floral bract, ovary and flower, the stigmas (*s*), 2 the petals, 3 upper part and beak of ovary, column with the anthers, the lip and its spur, *in profile*, 4 pollinia; *all enlarged.*

9. HABENARIA STENANTHA, Hook. fil. Fl. Br. Ind. VI, 153.

Height of plant 12 to 24 in., with no tuber, but the roots thick and fleshy. *Stem* stout and sheathed at the base. *Leaves* about three or four, the lowest usually the largest, 4 to 9 in. long, oblong-lanceolate to oblong-oblanceolate, acute or sub-acute, very little narrowed to the long sheathing base; the upper part of the stem with narrowly lanceolate acuminate bracts ·4 to ·75 in. long, diminishing upwards. *Spike* 5 to 9 in. long, laxly-flowered. *Flowers* ·65 to ·8 in. across; *floral bract* linear-lanceolate, as long as the shortly-stalked ovary in the lower flowers, but shorter in the upper. *Sepals* unequal; the dorsal concave, broadly ovate, blunt, erect; the lateral pair smaller, ovate-elliptic, sub-acute, reflexed, all 3-nerved. *Petals* longer than the dorsal sepal, linear, blunt, 1-nerved, erect. *Lip* longer than the sepals, lanceolate, blunt, entire, 3-nerved; *spur* slender, cylindric, widening a little towards the tip, curving, longer than the rather straight slender beakless ovary. *Anther-cells* converging at the apex; the staminodes elongate; anther-tubes none; *pollinia* broadly elliptic-clavate, faintly grooved, their caudicles rather short; the glands very large, elongate, situated at the sides of the entrance to the spur and reaching to the stigma. *Stigmas* conjoined into a small transversely-oblong mass situated on the upper margin of the entrance to the spur.

Sikkim, at elevations from 8,000 to 12,000 feet; Hooker, Thomson, Clarke, Gammie and others; in flower from July to September; Pantling No. 233. Chumbi (in Tibet), King's Collectors.

The sepals and petals of this are green and the lip is yellowish. It closely resembles *H. latilabris*, but has differently shaped erect petals and a very different column, the stigma being single and transverse. The staminodes, too, differ in shape from those of *H. latilabris*, and the gland very notably so.

PLATE 412.—*Habenaria stenantha*, Hook. fil. A plant, *of natural size.* Fig. 1 sepals and petals, separated, 2 ovary and flower, *seen from the side*, 3 lip, 4 column showing the anther-cells and staminodes, glands of the pollinia (*p g*) and stigma (*s*), 5 pollinia; *all enlarged.*

10. HABENARIA BAKERIANA, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 132.

Height of the whole plant 9 to 18 inches. *Stem* about ·25 in. thick at the base, and with one or more sub-acute convolute sheaths. *Leaves* several, scattered,

sessile; the lower one oblong, sub-acute, with the base broad and sheathing, 3 to 5 in. long; the upper three or four linear-lanceolate, diminishing in size upwards. *Spike* 4 to 7 in. long, laxly-flowered; *floral bract* linear-lanceolate, much longer than the slender sessile ovary. *Flowers* ·8 or ·9 in. long to the tip of the spur. *Sepals* oblong-ovate, the dorsal sepal conniving with the petals and forming a hood over the column, the lateral pair reflexed. *Petals* about as long as the sepals, broadly ovate, oblique, sub-acute, the bases broad. *Lip* fleshy, oblong, blunt, slightly broader towards the base, entire, equalling the lateral sepals in length; *spur* slender, twice as long as the ovary and curved forwards, cylindric. *Column* stout. *Anther-cells* close together, parallel, without tubes; *pollinia* elliptic, slightly clavate, without caudicles, attached obliquely to an elongate narrow gland truncate at each end; *staminodes* obovate, lying transversely below the anther (their broad ends directed outwards), above the conjoined stigmas and opposite the opening into the spur. *Stigmas* conjoined to form a bi-lobed broadly elliptic mass under the orifice of the spur and between the narrow ends of the staminodes.

Sikkim, in the Lachen Valley, at an elevation of 9,000 feet; Sin-ga-le-la Range at elevations of 10,000 to 12,000 feet; in flower in July; Pantling No. 401.

This species resembles *H. leptocaulon*, Hook. fil., but has a broader lip, a longer more curved spur, and coherent stigmas. It has also larger floral bracts and broader leaves. We have dedicated the species to Mr. J. G. Baker, F.R.S., Conservator of the Herbarium of the Royal Gardens, Kew. The colour of its flowers is green.

PLATE 413.—*Habenaria Bakeriana*, King and Pantling. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary and column, showing the anthers, staminodes (*a*), stigma (*s*) and the entrance to the spur (*c*), 3 the petals, 4 the lip, 5 section of spur, 6 pollinia; *all enlarged*.

11. HABENARIA JUNCEA, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 132.

A slender plant about 12 in. high. *Leaf* solitary from near the base of the stem, from 1·5 to 2·5 in. long and ·65 in. broad, narrowly oblong, acute, tapering from below the middle to the narrowed sheathing base, the stem above the leaf (peduncle of the spike) with two distant lanceolate bracts about ·75 in long. *Spike* 2 to 4 in. long, few-flowered. *Flowers* ·1 in. long; the *floral bract* equalling or exceeding the slender shortly stalked and slightly beaked ovary. *Sepals* ovate-lanceolate, acute, the dorsal broader than the lateral slightly spreading pair. *Petals* narrowly oblong, tapering to the rather blunt and slightly incurved apex. Limb of lip as long as the sepals, ovate-lanceolate, sub-acute, quite entire; the *spur* shorter than the limb, vertically compressed, slightly curved and sub-clavate. *Column* with its summit beaked and over-hanging the stigma; *anther-cells* close together, parallel, without tubes; *staminodes* large, ovoid-globose, lying by the sides of the orifice of the spur. *Stigmas* conjoined into a single large sub-globose mass lying above the entrance to the spur.

Sikkim, Lachen and Lachoong Valleys, Gnatong and Sin-ga-le-la; at elevations of 11,000 to 12,000 feet; in flower in August; Pantling No. 406.

This is near *H. nematocaulon*, Hook. fil.; but that species has the lip superior, the ovary being twisted to the extent of one complete spiral. It has been found

impossible to remove from flowers preserved in fluid the pollinia intact. No description of them is therefore given.

PLATE 414.—*Habenaria juncea*, King and Pantling. A plant, *of natural size*. Fig 1 bract, ovary and flower, 2 apex of ovary and column, showing the over-arching summit of the latter, the anther-cells (*a c*), staminodes (*b*), and conjoined stigmas (*s*), 3 the petals, 4 lip, 5 section of spur; *all enlarged*.

12. HABENARIA URCEOLATA, Clarke in Journ. Linn. Soc. XXV, 73, t. 30.

Whole plant 2 to 6 in. high; the *tubers* narrowly oblong. *Stem* slender, curved, with a single sheath at the base. *Leaf* usually solitary, rising rather below the middle of the stem, narrowly elliptic-oblong, obtuse or sub-acute, tapering to the long narrow tubular sheath; length 1·25 to 3·5 in., breadth ·25 to ·85 in.; peduncle of the raceme with several remote bracts, sometimes one of them leaf-like. *Raceme* ·65 to 2 in. long, decurved, rather laxly-flowered, secund. *Flowers* narrowly campanulate, longer than the ovaries (·3 in. long); *floral bract* linear-lanceolate, erect, longer than the shortly-stalked tumid ovary. *Sepals* sub-equal, all erect, not spreading; the dorsal elliptic, blunt, not connivent with the petals; the lateral pair oblong, sub-acute. *Petals* as long as the sepals, free, oblong, blunt, tapering slightly to the base, somewhat falcate. *Lip* about as long as the petals and sepals, decurved beyond the middle, oblong, slightly concave, minutely hispid near the base, tapering and becoming thicker towards the blunt apex; *spur* shorter than the sepals, narrowly ellipsoid, constricted near the neck. *Column* elongate, the apex pointed. *Anther-cells* close together but not touching, long, parallel; *pollinia* ellipsoid, each consisting of a pair of flattened masses composed of large granules, the caudicles very short; the glands elliptic, acute at one end; *staminodes* long, filiform, lying parallel to the anther-cells and exceeding them in length, their apices free. *Stigmas* conjoined, large, occupying the whole of the anterior surface of the column below the glands of the pollinia. Hook. fil. Fl. Br. Ind. VI, 165. *Diphylax urceolata*, Hook. fil. Ic. Plantar., t. 1865.

Sikkim, at Yak-la, elevation 10,000 feet, Clarke. At Naoura, on the Nepal frontier, elevation 12,000 feet, King's Collectors. Cho-la; G. Gammie, No. 1294. Chumbi; King's Collectors. Ti-am-phung and Re-chi-la, 9,000 feet; Pantling No. 347.

The flowers are white.

PLATE 415.—*Habenaria urceolata*, Clarke. An entire plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary, part of spur and column, showing the anther-cells, polliniar glands (*g*), staminodes (*a*), and stigma (*s*), 2 ovary, spur and base of flower, *side view*, 4 the petals, 5 lip, 6 section of spur, 7 pollinia; *all enlarged*.

13. HABENARIA NEMATOCAULON, Hook. fil. Fl. Br. Ind. VI, 154.

Whole plant 2·5 to 9 in. high; *tuber* narrowly oblong, obtuse. *Stem* slender, with a short tubular sheath ·5 in. long at the base, and not far above it a single elliptic leaf with a blunt or sub-acute apex and narrowed shortly sheathing base, ·75 to 1·75 in. long and ·25 to ·75 in. broad; the stem above the leaf long, and bearing one to three linear-lanceolate bracts diminishing upwards from ·5 to ·25 in. in length. *Spike* ·5 to 1·5 in. long, slender, rather densely-flowered. *Flowers* small, about ·15 in. across; *floral bract* linear, obtuse, longer than the erect, cylindric,

beakless, completely twisted ovary. *Sepals* sub equal, linear-lanceolate, obtuse, connivent. *Petals* about as long but broader, triangular-lanceolate, obtusely acuminate, falcate. *Lip* not fleshy, as long as the sepals and petals, oblong-lanceolate, obtuse, entire; *spur* much shorter than the lip (usually less than half as long), slightly curved, stout, compressed from front to back. *Column* very short. *Anther-cells* short, broad, parallel, touching, without tubes; *pollinia* narrowly elliptic, grooved, without caudicles; the glands small, oblique, elliptic, situated far inside and placed near the margin of the two large conjoined stigmatic lobes above the mouth of the spur. *Capsule* sessile, erect, fusiform, ·35 in. long.

Sikkim, on Re-chi-la, elevation 9,000 feet; in flower during August; Pantling No. 341; also collected by Hooker, Clarke and King's Collectors at Ling-too and Gun-tok at elevations of about 10,000 feet.

The colour of the flowers is white.

PLATE 416.—*Habenaria nematocaulon*, Hook. fil. A plant, *of natural size*. Fig. 1 bract, ovary, and flower, *side view*, 2 apex of ovary and column, showing the anther-cells and the glands of the pollinia (*p g*), stigmas (*s*), 3 the petals, 4 lip, 5 section of spur, 6 pollinia; *all enlarged*.

14. HABENARIA SIKKIMENSIS, Hook. fil. Fl. Br. Ind. VI, 155.

Height of entire plant 10 to 12 inches. *Stem* short, bearing one or two rather wide blunt sheaths at the base, and two unequal, remote, narrowly elliptic-oblong sub-acute or acute leaves narrowed to the sheathing base, 2·5 to 4 in. long and ·5 to 1·25 in. broad, the upper the smaller of the two. *Raceme* elongate, laxly-flowered. *Flowers* ·5 in. across at the mouth; *floral bract* large, foliaceous, linear, acuminate, ·5 to 2·5 in. long, the lower ones revolute and many times longer than the short pedicelled and abruptly-beaked ovary. *Sepals* unequal; the dorsal elongate-triangular, with a broad base and sub-acute apex; the lateral pair nearly twice as long, linear-lanceolate, acute, strongly revolute. *Petals* reflexed, as long as the lateral sepals, falcately lanceolate, cordate-acuminate, the apices rather blunt. *Lip* membranous, lanceolate, straight, caudate-acuminate, entire; *spur* much longer than the ovary, cylindric, boldly curved, the mouth infundibuliform, the apical half quadrate in section. *Anther-cells* pyriform, discrete, converging at the apex, their tubes long; *pollinia* elliptic, with blunt ends, vertically grooved, shorter than the compressed curved caudicles; the glands broadly ovate. *Stigmas* large, united above the mouth of the spur, bordered above by a narrow belt. *Staminodes* elongate, narrow, parallel to the tubes of the anther-cells.

Sikkim, on Sinchal, elevation 8,000 feet; Thomson; Ling-too and Ze-lep-la. King's Collectors. Sin-ga-le-la, and in the Lachoong valley at elevations of about 12,000 feet; in flower during August and September; Pantling No. 421.

The colour of the flowers is green.

PLATE 417.—*Habenaria Sikkimensis*, Hook. fil. A plant, *of natural size*. Fig. 1 flower, 2 stalked ovary, column and lip, *in profile*, 3 sepals, petals and lip flattened out, 4 column showing the anthers with their tubes and polliniar glands, the united stigmas (*s*), staminodes, and the entrance to the spur, 5 pollinia, 6 section of spur; *all enlarged*.

15. Habenaria Dyeriana, King and Pantling in Journ. As. Soc. Beng, Vol. LXV, Pt. 2, 133.

A slender plant not exceeding 12 inches in height. *Stem* at its base with a sheathing blunt oblanceolate bract 1 in. long. *Leaves* three or four, sessile, 1 to 1·75 in. long, scattered along the stem at distant intervals and becoming smaller upwards, the uppermost bract-like, all more or less oblong-lanceolate with sub-acute apices and broad sheathing bases. *Spike* 3 to 4 in. long, laxly-flowered. *Flower* (including the spur) ·5 to ·6 in. long; *bract* foliaceous, diminishing upwards, ovate-lanceolate, as long as or exceeding the sessile scabrid slenderly-beaked ovary. Dorsal *sepal* ovate-lanceolate; the lateral pair narrowly oblong, blunt, reflexed. *Petals* erect, lanceolate, sub-acute, with very oblique bases, slightly undulate on their inner margins. *Lip* rather fleshy, convex, straight, deflexed, a little longer than the lateral sepals, narrowly oblong-triangular, with two small rounded auricles near its base, the margins in its lower half obscurely waved and with a short abrupt bend quite at the apex. *Spur* slender, incurved, equal to or slightly longer than the ovary, slightly compressed laterally. *Column* short and broad. *Anther-cells* distant, clavate, their tubes rather long and curved inwards; *pollinia* ovoid; their caudicles long, slender; the glands small, discoid; *staminodes* large, smooth, cylindric, situated vertically by the outer sides of the anther-cells. *Stigmas* conjoined into a transversely oblong broad band lying above the entrance to the spur and between the glands of the pollinia, the upper margin of the conjoined stigmas bordered by a narrow band.

Sikkim, in the Lachen valley, elevation 11,000 feet; in flower during August; Pantling No. 407.

The colour of the flowers is green.

A very distinct species belonging to the section *Hologlossa*. The floral bracts are leaf-like and gradually decrease in size upwards. The size and position of the very large stigma stretching across the wide column almost to its edges, and situated above the opening of the spur, are good distinguishing marks of this species. It is dedicated to Mr. W. T. Thiselton-Dyer, F.R.S., C.M.G., C.I.E., Director of the Royal Garden, Kew.

Plate 418.—*Habenaria Dyeriana*, King and Pantling. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 column showing the anther-cells and the glands of the pollinia (*p g*), the staminodes (*b*), the conjoined stigmas (*s*), and the mouth of the spur (*c*), 3 bract, ovary and spur, *in profile*, 4 the petals and lip, separated and spread out, 5 section of spur, 6 pollinia; *all enlarged*.

16. Habenaria Biermanniana, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 343.

Height of plant 9 to 15 in.; *tubers* cylindric-ovoid, 1·25 in. long, sparsely hairy. *Stem* rather stout, with one or two wide-mouthed sheaths near the base. *Leaves* four or five, cauline, scattered, amplexicaul, lanceolate, acute, boldly nerved, 2 to 3 in. long; *stem* above the leaves with a lanceolate bract. *Spike* 4 in. long, rather sparsely-flowered; *bract* linear-lanceolate, acuminate, exceeding the sessile and scarcely beaked ovary. *Flowers* ·3 in. long. *Sepals* and *petals* sub-equal; sepals ovate-lanceolate, with oblique bases, concave, sub-acute, cohering and, with the triangular-lanceolate petals, forming a hood from the base of which the lip and spur project. *Lip* fleshy, much decurved, linear-oblong, tapering slightly to the obtuse apex, with minute and tooth-like side lobes;

spur about as long as the lip, curved, sub-clavate, dorsally compressed *Column* arching over the entrance to the spur, very short. *Anther-cells* nearly parallel; *pollinia* broadly pyriform, longer than the curved stout caudicles, glands oblong; *staminodes* oblong, attached externally to the anther-cells. *Stigmas* two, small, oblong, lying at each side of the entrance to the spur.

Sikkim, on Sinchal, at an elevation of 8,000 feet; Sin-ga-le-la, elevation 10,000 feet; flowering in July; Pantling No. 332.

A very distinct species; dedicated to the memory of the late Adolf Biermann, for many years resident on the Government Cinchona Plantation in Sikkim, and who died as Curator of the Botanic Garden, Calcutta.

PLATE 419.—*Habenaria Biermanniana*, King and Pantling. An entire plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 column showing the back of the anther-cells, the staminodes, stigmas (*s*), entrance to the spur and the base of the lip, 3 lip, 4 the petals, 5 section of spur, taken from its widest part, 6 pollinia; *all enlarged*.

17. HABENARIA DENSA, Wall. in Lindl. Gen. and Spec. Orch., 326.

Stem 12 to 30 inches. *Tubers* oblong. Stem clothed in its lower part with long loose blunt sheaths. *Leaves* three to five, narrowly elliptic, acute, tapering very little to the long sheath; length 2·5 to 4 in., breadth ·75 to 1·5 in. Peduncle of the spike 6 to 18 inches long, bearing a few linear-lanceolate bracts, diminishing in size upwards. *Spike* 6 to 12 or even 18 in. long; its rachis short, rather densely flowered. *Flowers* ·35 in. across; *floral bract* lanceolate, acuminate, ciliolate, longer than the tumid shortly-beaked curved short ovary. *Sepals* sub-equal, thick, ciliolate, elliptic-oblong, obtuse, the dorsal erect and concave; the lateral pair narrower, reflexed. *Petals* nearly as long as the sepals, elliptic-oblong, with oblique bases and blunt apices, the exposed margin fleshy, that overlapped by the dorsal sepal thin. *Lip* as long as the sepals, linear, obtuse, with a transverse callus at its base close to the column; *spur* clavate, half as long as the ovary, pendulous, compressed laterally. *Column* short, broad. *Anther-cells* distant, parallel, without tubes; *staminodes* large, consisting of two united elongate processes; the upper pair rough and parallel to the lower halves of the anther-cells; the lower pair smooth, their apices converging inwards below the stigmas and almost meeting over the base of the lip; *pollinia* elliptic, tapering very little to the base, the caudicles short; the glands oblong, situated at the sides of the opening into the spur. *Stigmas* two, small, sub-orbicular, convex, lying between the glands of the pollinia and the staminodes. Hook. fil. Fl. Br. Ind. VI, 153; Kräntzlin in Engl. Bot. Jahrb. XVI, 216. *Platanthera densa*, Lindl. in Wall. Cat. 7046. *P. clavigera*, Lindl. Gen. and Spec. Orch., 289.

Sikkim, in the Lachong valley and on the Sing-ga-le-la range, at elevations of from 8,000 to 12,000 feet; in flower during July and August; Hooker, Gammie, Pantling No. 413. Westward along the range to Simla; also in Chumbi in western Bhotan.

The colour of the flowers is green throughout.

PLATE 420.—*Habenaria densa*, Wall. A plant, *of natural size*. Fig. 1 a flower, 2 profile view of bract, sessile ovary, column and lip with its spur, 3 the petals, 4 lip, 5 column showing the callus (*c*) at the base of the lip where the latter joins the column, the stigmas (*s*), staminodes (*t*), and entrance to the spur (*m*), 6 section of spur, 7 apex of the same, 8 pollinia; *all enlarged*.

18. Habenaria leptocaulon, Hook. fil. Fl. Br. Ind. VI, 154.

Whole plant 8 to 16 inches high. *Stem* slender, sheathed in the lower third. *Leaves* two, unequal, remote, the lower and larger narrowly elliptic, acute, much narrowed from below the middle to the long narrow sheath; length from 2 to 5 in., breadth about ·75 in. or less; the upper linear-lanceolate, acuminate, sheathing at the base, half as long as the lower; stem above the leaves bearing two or three remote lanceolate acuminate unequal bracts ·75 to 1 in. long. *Spike* 1 to 3 in. long, few-flowered, lax. *Flowers* about ·5 in. across (vertically); *floral bract* lanceolate, shorter than or equal to the slender curved grooved beakless erect ovary. *Sepals* sub-equal, oblong-elliptic, acute; the dorsal connivent with the petals, the lateral pair reflexed. *Petals* broader than the sepals, fleshy, lanceolate from a broad truncate base, sub-acute, falcate. *Lip* fleshy, longer than the sepals and petals, oblong-lanceolate, obtuse, entire, deflexed; *spur* much longer than the ovary, cylindric, slightly dilated towards the base and more so towards the apex, somewhat curved, minutely hispid inside. *Column* rather long. *Anther-cells* slightly separated, quite parallel; *pollinia* elliptic, tapering to both base and apex, each obliquely sessile on an elongate gland, truncate at both ends. *Staminodes* smooth, ovate, falcate, pointed, situated outside the bases of the anther-cells. *Stigmas* two, broadly oblong, somewhat curved, situated one on each side of the wide entrance to the spur.

Sikkim, in the Lachong valley, at elevations of from 9,000 to 11,000 feet; G. Gammie, Pantling No. 422; in flower during July and September.

The colour of the flowers is green throughout.

Plate 421.—*Habenaria leptocaulon*, Hook. fil. A plant, *of natural size*. Fig. 1 ovary and flower, 2 bract, ovary, column and lip, *in profile*, 3 column showing the anthers, staminodes and stigmas (*s*), 4 the petals, 5 section of the spur, 6 pollinia; *all enlarged*.

19. Habenaria oligantha, Hook. fil. Fl. Br. Ind. VI, 154.

Plant varying in height from 3 to 12 inches. *Stem* slender, sheathed at the base, *tubers* narrowly fusiform. *Leaf* usually solitary, oblong-oblanceolate, obtuse or acute, narrowed to the shortly sheathed base; length ·1 to 4·5 in., breadth ·35 to 1·5 in. Stem above the leaf and below the raceme with at least one linear-lanceolate acuminate bract, ridged. *Spike* 1·5 to 4 in. long, laxly-flowered. *Flowers* ·4 in. across at the mouth (vertically); *floral bracts* linear-lanceolate, acuminate, herbaceous, the lower much longer than the flowers, the upper sub-equal to them. *Sepals* thin, their edges minutely ciliolate, sub-equal, elliptic-oblong, sub-acute; the dorsal sepal and petals connivent to form a hood, the lateral pair reflexed. *Petals* fleshy like the lip, as long as the sepals, ovate with broad truncate bases and somewhat gibbous at one side, sub-acute. *Lip* longer than the sepals and petals, ovate-lanceolate, blunt, entire, its margins slightly upturned near the base; *spur* about as long as the ovary, cylindric, with two faint ridges externally, slightly wider towards the apex, its interior shortly hispid. *Column* broad at the base, tapering upwards. *Anther-cells* discrete, parallel, without tubes; *pollinia* clavate, sessile, the glands as long as the pollinia, narrow, truncate at each end; *staminodes* large, globose; *stigmas* two, globose, pointed.

Sikkim, in the Lachen valley, elevation about 10,000 to 12,000 feet; at Na-toot, Na-tong and Jongri; in flower from July to September; Pantling No. 328.

The colour of the flowers is green.

PLATE 422.—*Habenaria oligantha*, Hook. fil. A plant, *of natural size*. Fig. 1 bract, ovary and flower, *side view*, 2 column, showing the anther-cells, polliniar glands, staminodes, and stigmas (*s*) at the entrance to the spur, 3 lip, 4 the petals, 5 section of spur at its thickest part, 6 pollinia; *all enlarged*.

20. HABENARIA LATILABRIS, Hook. fil. Fl. Br. Ind. VI, 153.

Height of whole plant 8 to 18 in. high; *tubers* fusiform. *Stem* naked near the base. *Leaves* about five; the middle two 2 to 4 in. long, elliptic-oblong, acute; the lower and upper smaller and more acute; all broad and sheathing at the base; bract below the raceme lanceolate, acuminate, nearly 1 in. long. *Spike* 3 to 10 in. long, laxly-flowered, its peduncle short. *Flowers* ·4 to ·5 in. across; *floral bract* lanceolate, acuminate, somewhat longer than the ovary. *Sepals* unequal, glabrous or ciliolate; the dorsal concave, broadly ovate, orbicular or oblong; the lateral pair narrower, ovate or ovate-lanceolate, sub-acute, reflexed. *Petals* as long as the lateral sepals, spreading, fleshy, with broad triangular bases and bluntly acuminate apices, varying to lanceolate or linear, gibbous at the base on one side. *Lip* longer than the petals, sub-terete or linear-oblong, tapering slightly to the apex, entire, the base with a short broad claw; the *spur* slender, cylindric, laterally compressed, curved, longer than the curved slightly beaked ovary. *Column* short. *Anther-cells* parallel, distant, each with a sub-globular rugulose staminode on its outer side near the base; the tubes short, curved forwards; *pollinia* pyriform, tapering into short stout caudicles; the glands small, elliptic. *Stigmas* two, oblong, blunt, separated by the entrance into the spur. *Capsule* sessile, fusiform, shortly beaked, curved. Hook. fil. in Ann. Bot. Gard. Calc. V, 66, t. 100. *Platanthera acuminata*, Lindl. in Wall. Cat. No. 7040; Gen. and Spec. Orchid, 289. *P. latilabris*, Lindl. Gen. and Spec. Orch., 289. *P. orchidis*, Wall. Cat. 7039B.

Sikkim, in the Lachoong and Lachen valleys; on the Sin-ga-le-la range at elevations of 8,000 to 10,000 feet; in flower from July to September, common; Pantling No. 331. Westward along the chain to Kashmir. In Dehra Dun; King, Hope.

The sepals of this plant in Sikkim are green, as is the bract; and the petals and lip are of a greenish-yellow. The species is a very common and variable one. In the north-west Himalaya the leaves are occasionally almost orbicular; the lip varies in width from linear to lanceolate but its edges are always reflexed. A small form is common in Sikkim.

PLATE 423.—*Habenaria latilabris*, Hook. fil. A plant, *of natural size*. Fig 1 ovary, bract and flower, *seen from the side*, 2 column showing the anthers and staminodes, polliniar glands, stigmas (*s*), and entrance to spur, 3 lip, 4 the petals, 5 section of spur, 6 pollinia; *all enlarged*.

21. HABENARIA CUMMINSIANA, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 343.

Height of plant 6 to 9 in.; *tubers* oblong. *Leaves* two to four, unequal, inserted on the lower part of the stem, with a lanceolate bract a little below the spike, broadly

elliptic to lanceolate, rather thick, 2 to 3 in. long and 1 to 1·5 in. broad. Peduncle of the spike angled. *Spike* 1·25 to 3 in. long, rather densely-flowered; *bract* longer than the slender beaked ovary, its edges ciliolate. *Flowers* ·75 in across. Dorsal *sepal* ovate, ·25 in. long; the lateral pair narrower, wide-spreading, their edges ciliolate, ·4 in. long. *Petals* fleshy, slightly exceeding the dorsal sepal and with it forming a hood, triangular, blunt, sub-falcate, the inner edge irregularly crenate near the base, the outer edge entire, the apex sub-acute, the base truncate. *Lip* very fleshy, without side lobes, longer than the lateral sepals, almost cylindric, abruptly deflexed from the thin flattened base (? claw), the surface of the cylindric part slightly carunculate; *spur* slender, curved, longer than the ovary, slightly compressed laterally, pubescent inside. *Column* very short; *anther-cells* distant, the space between them wide, smooth; *pollinia* cylindric, slightly clavate, rather longer than their stout caudicles and attached to them nearly at a right angle; glands small, sub-rotund. *Stigmas* two, large, parallel, oblong, situate below and by the side of the entrance to the spur, tapering at their upper ends; the edges of the stigmas and half the mouth of the spur margined by a distinct fleshy belt.

Sikkim, at Gnatong, elevation 11,000 feet; in flower during July; Cummins; Lachoong Valley, Pantling No. 329.

The flowers are green throughout. This species was first collected by Dr. H. A. Cummins, Surgeon to a detachment of troops stationed for some time near the Tibet frontier, an ardent botanist and excellent collector, to whom we have dedicated it. It is allied to *H. pachycaulon*, Hook. fil., but is perfectly distinct.

PLATE 424.—*Habenaria Cumminsiana*, King and Pantling. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 column showing the anthers, polliniar glands, staminodes, stigmas (*s*), and the entrance to the spur, 3 lip, 4 petals, 5 section of spur, 6 pollinia; *all enlarged*.

22. HABENARIA ALBO-MARGINATA, *new species*.

Height of entire plant not exceeding 8 inches; *tuber* depressed-globular. *Stem* rather stout, bearing a wide-mouthed tubular sheath at the base. *Leaves* two, remote, unequal, orbicular-elliptic to oblong, blunt, only slightly contracted at the base to the rather long tubular sheath; length 1 to 1·75 in., breadth ·75 to 1 in.; peduncle of the spike stout, short, ebracteate. *Spike* 1 to 1·5 in. long, 8- to 10-flowered. *Flowers* ·25 in. across at the mouth, expanding from above downwards; *bract* of the lowest flower occasionally large, foliaceous, lanceolate, spreading, about ·8 in. long; those of the other flowers minute, triangular, only ·06 in. long; the ovary sessile, tumid near the base, the apex with a stout curved beak. *Sepals* similar, spreading, broadly elliptic-ovate, blunt. *Petals* shorter than the sepals, sub-rotund, concave, not connivent with the dorsal sepal. *Lip* fleshy, slightly shorter than the sepals, broadly oblong, deeply 3-fid; the central lobe longer than the lateral pair, oblong, tapering to the blunt apex; the lateral lobes much shorter, parallel, oblong, slightly falcate; *spur* cylindric, slightly depressed from front to back, tapering very slightly at the apex, straight, horizontal, shorter than the ovary. *Column* very short. *Anther-cells* touching by their apices, the bases divergent; *pollinia* clavate-elliptic, with oblique apices, the caudicles short and stout; the glands minute, broadly elliptic, attached laterally. *Staminodes* large, rugulose, sub-globular, lying external to the anther-cells. *Stigmas* united into a narrowly reniform horizontal band lying between the anther-cells and above the mouth of the spur.

Sikkim, near Jongri, elevation about 13,000 feet; in flower during June; Pantling No. 450.

The sepals are green with white margins, the other parts of the flower being white. The centrifugal inflorescence is a very unusual feature in a *Habenaria*.

PLATE 425.—*Habenaria albo-marginata*, King and Pantling. An entire plant, *of natural size*. Fig. 1 apex of ovary and flower, 2 floral bract, ovary, column and lip, *in profile*, 3 the petals and lip separated, 4 apex of ovary and column, showing anther-cells, pollinia and their glands, staminodes (*a*), stigma (*s*) and mouth of spur (*c*), 5 section of spur, 6 pollinia; *all enlarged*.

23. HABENARIA PARISHII, Hook. fil. Fl. Br. Ind. VI, 161.

Whole plant 12 to 18 in. high; *tuber* ellipsoid, hairy, the stem close above it bearing many fibrous roots. *Stem* clothed in its stout lower part with wide, lax, blunt sheaths. *Leaves* four or five in a whorl at the summit of the stem, ovate-elliptic, acute, narrowed to the broad short sheaths, 2·5 to 5 in. long and 1 to 1·75 in. broad; peduncle of the spike slender, bearing a few distant lanceolate acuminate bracts. *Spike* narrow, 4 to 8 in. long, many-flowered. *Flowers* not crowded, horizontal, ·25 in. in diam. at the mouth; *floral bract* lanceolate, shortly acuminate, longer or shorter than the erect sessile ovary. *Sepals* rather unequal; the dorsal larger than the narrowly oblong obtuse spreading lateral pair. *Petals* larger than the sepals, broadly ovate, sub-acute. *Lip* slightly longer than the petals, shortly 3-lobed beyond the middle, curved and the apex deflexed; the side lobes triangular, acute, their apices directed forwards; apical lobe oblong, tapering to the obtuse point; *spur* shorter than the sepals, straight, widely fusiform. *Anther-cells* almost touching by their parallel inner margins, without tubes; *pollinia* pyriform, with very short caudicles, attached laterally to the small oblong glands; *staminodes* large, rugulose, situated by the sides of the anther-cells. *Stigmas* two, irregularly oblong, curved, lying below the anther-cells and touching by their inner edges. *Capsule* tumid, falcate, broadly ridged, ·35 in. long. *Peristylus Parishii*, Hook. fil.; Reichb. fil. in Trans. Linn. Soc. XXX, 139. *H. vertiillata*, King and Pantling MSS.

Sikkim, at Silake, elevation 2,000 feet; in flower during June; Griffith (Kew Distrib. No. 5305), King, Pantling No. 156. Upper Burma at Meiktela; collectors of Bot. Gard., Calcutta. At Moulmein; Parish. S. Andaman Island; Kurz, King's collectors.

The sepals are brown tinged with olive green, and the petals and lip are olive green. This appears to be the same as Griffith's specimen from Bhotan, (No. 28 in the Kew Herbarium). The lip of this is sigmoidly curved (as is shown in Fig. 2 of our Plate), whereas in *H. goodyeroides*, Don, which is probably its nearest ally, the lip is flat with an oblong depression in front of the minute opening into the spur. The spur of *H. goodyeroides* is moreover globular, whereas the spur of this is fusiform. There are considerable differences also in the columns of the two, as will be at once seen by comparing the figures numbered 2 in our plates of each. The flowers of this are green and inodorous, whereas the flowers of *H. goodyeroides* are cream-coloured or white and fragrant. An allied species is also *H. constricta*.

PLATE 426.—*Habenaria Parishii*, Reichb. fil. A plant, *of natural size*. Fig. 1 bract, ovary, and flower, 2 bract, ovary, column and lip, *in profile*, 3 apex of ovary and column, showing anther-cells and polliniar glands, staminodes, and stigmas, 4 pollinia, *front and side views; all enlarged*.

24. Habenaria tentaculata, Reichb. fil. Otia, p. 34; Trans. Linn. Soc. XXX, 139.

Whole plant 6 to 18 in. high; the *tuber* obliquely ellipsoid. *Stem* with a single wide blunt sheath at its base. *Leaves* two or three, often unequal, borne close together near the base of the stem, oblong-elliptic or linear-oblong, sub-acute or acute, slightly narrowed to the short sheath; length 2 to 4 in., breadth ·5 to 1·25 in.; peduncle of the spike naked except for a few scattered linear-lanceolate bracts about ·5 in. long. *Spike* very narrow, 1·25 to 6 in. long, laxly-flowered. *Flowers* scarcely broader than the apices of the long erect ovaries, ·15 in. across at the mouth; *floral bract* lanceolate, acuminate, rather shorter than the sessile ovary. *Sepals* unequal; the dorsal ovate-oblong, obtuse, conniving with the petals to form a hood; the lateral pair narrowly oblong, obtuse, erect. *Petals* ovate, acute, their bases oblique. *Lip* longer than the lateral sepals, deflexed from the middle; the lower half broadly oblong and having a transverse callus at the base; the apical half 3-lobed, the middle or apical lobe shorter and broader than the lateral, oblong, blunt; the lateral lobes linear, falcate, their apices diverging; *spur* small, ovoid, much contracted at the neck, shorter than the sepals, smooth within. *Column* depressed. *Anther-cells* discrete, their tubes short; *pollinia* pyriform, the caudicles half as long, tapering to the minute narrowly oblong dark red glands; *staminodes* large, diverging. *Stigmas* two, triangular, lying by the sides of the mouth of the spur, their apices diverging. Kräntzlin in Engl. Bot. Jahrb. XVI, 160. *H. lacertifera*, Benth. Fl. Hong-Kong, 362; Hook. fil. Fl. Br. Ind. VI, 163. *Cœloglossum lacertiferum* and *C. acuminatum*, Lindl. Gen. and Spec. Orch. 302. *Peristylus chloranthus*, Lindl. in Kew Journ. Bot. VII (1855), 37. *Gymnadenia* (*?*) *tenuiflora*, Lindl. in Wall. Cat. 7055. *Chæradoplectron Spiranthes*, Schauer in Pl. Meyen., (Act. Leopold.), 436, t. 13, C. ?

Sikkim. Guru Bathan (1,500 feet ?); in flower during August; Pantling No. 345. Khasia Hills; Hooker, Mann, Gellatly. Naga Hills; Prain Nos. 43, 64; also in Tenasserim, Tavoy and Penang; Wallich. Distrib.—Hong-Kong.

The colour is green throughout.

A widely distributed species varying as to its lip, which is said to be in some specimens only obtusely 3-toothed, while in others it is deeply tripartite and the side lobes are long and resemble tentacles. The flowers are very small and the material in collections is scanty. We have followed Kräntzlin in adopting Reichenbach's name for this rather than Bentham's, as the former is the older. For the Sikkim form of the plant it is, however, very inappropriate, as no part of the flower suggests tentacles. It appears to be in Hong-Kong only that plants are found with much elongated side lobes to the lip, and it was for these that Lindley suggested the name *Glossula tentaculata* (Bot. Reg., t. 862). This is allied to *H. aristata*, Hook. fil., but is distinguished from that species by having its leaves radical and not scattered along the stem, and by having flowers only about one-third as large. In *H. aristata*, moreover, the lip is narrowed at the base and has linear horizontal side lobes; whereas in this the lip is broad at the base and is divided near the middle into three linear lobes, all of which are decurved.

Plate 427.—*Habenaria tentaculata*, Reichb. fil. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary, base of the lip and column showing the anther-cells (*a*), a staminode (*s c*), a stigma (*s*), and the callus at the base of the lip (*c*), 3 the petals, 4 pollinia; *all enlarged*.

25. Habenaria fallax, King and Pantling.

Whole plant 4 to 12 in.; *tubers* small, ellipsoid. *Stem* 1 to 2 in. long, with two tubular blunt sheaths at the base. *Leaf* solitary (in Sikkim specimens), narrowly elliptic, acute, tapering slightly to the short sheath; length 1·5 to 6 in., breadth ·45 to ·75 in.; peduncle of spike long, with a single linear lanceolate acuminate bract. *Spike* 1·5 to 4 in. long, rather laxly-flowered. *Flowers* (to the end of the lip) ·35 in. at the mouth; *floral bract* lanceolate, shorter than or as long as the slightly decurved ovary. *Sepals* sub-equal, oblong or ovate-lanceolate, the dorsal connivent with the petals to form a hood; the lateral pair erect, non-connivent, but not spreading. *Petals* varying in size, oblong, blunt. *Lip* not much longer than the sepals, rather fleshy, hastately 3-lobed from about the middle; the apical lobe oblong, obtuse, deflexed, longer than the two oblong blunt slightly diverging side lobes; the base truncate and with a saccate spur much shorter than the sepals, 2-ribbed in the interior. *Column* rather long. *Anther-cells* discrete, parallel, without tubes; *pollinia* clavate, the caudicles short, stout, tapering to the small cordate glands; *staminodes* small, attached about the middle of the outer surfaces of the anther-cells. *Stigmas* two, transversely oblong, touching by their ends and forming a band across the column below the anther-cells. *Herminium fallax*, Lindl. in Wall. Cat. 7412; Hook. fil. Ic. Plant., t. 2198; Fl. Br. Ind. VI, 129. *Peristylus fallax*, Lindl. Gen. and Spec. Orch., 298. *Cybele*, Falc. in Lindl. Veg. Kingd., 193c; *C. alpina*, Falc. MSS.

Sikkim, at elevations of 10,000 to 12,000 feet; in the Lachen and Lachoong valleys, at Gnatong; Hooker, Pantling Nos. 174 and 426; in flower during July. Kamaon, on Liria-Kanta; Davidson. At Ralam; Strachey and Winterbottam.

The flowers are green throughout. Lindley at first named this *Herminium*, but he subsequently transferred it into his genus *Peristylus* which has since been reduced to *Habenaria*. We think it ought to be in *Habenaria*, having a very distinct wide spur and a lip much resembling those of other species in the section *Peristylus*, in which we have therefore placed it. Specimens from the western Himalaya have often two leaves which are sub-opposite.

Plate 428.—*Habenaria fallax*, King and Pantling. A plant, *of natural size*. Fig. 1 a flower, 2 ovary, column with anther-cells *in situ*, and lip, *in profile*, 3 section of spur, 4 pollinia; *all enlarged*.

26. Habenaria constricta, Wall. ex Hook. fil. Fl. Br. Ind. VI, 161.

Whole plant 20 to 30 in. high; *tuber* oblong, hairy. *Stem* stout, clothed at the base with wide blunt sheaths. *Leaves* five or six in a whorl about the summit of the stem, ovate-elliptic, acute or acuminate, much narrowed to the long stem-clasping sheath; length 3 to 7 in., breadth 1·25 to 3·5 in.; stem above the leaves with a few linear-lanceolate acuminate bracts, 1·25 to ·5 in. long, diminishing upwards. *Spike* broadly cylindric, 5 to 9 in. long, many- and densely-flowered. *Flowers* ·75 to ·9 in. across, horizontal; *floral bract* erect, lanceolate, acuminate, as long as or longer than the erect shortly beaked ovary. *Sepals* sub-equal, ciliolate, oblong, obtuse, the dorsal conduplicate; the lateral pair with involute margins, spreading. *Petals* larger than the sepals, obliquely ovate, lanceolate, rather bluntly acuminate, their bases oblique, somewhat gibbous on the lower side, spreading upwards in front of the dorsal sepal and not

conniving with it to form a hood. *Lip* as long as the petals, oblong, deeply 3-lobed in its anterior half; the middle lobe shorter than the side lobes, oblong, tapering to a blunt point; the lateral lobes linear, slightly falcate, their apices slightly diverging; *spur* broadly globular, very short, much shorter than the sepals, slightly compressed vertically. *Column* very short and broad. *Anther-cells* rather close together, but not touching, without tubes; *pollinia* oblong-obovoid, their caudicles short, tapering to the oblong-elliptic gland; *staminodes* oblong with blunt ends, situated externally to the anther-cells. *Stigmas* two, obovate-oblong, diverging outwards from near the polliniar glands. *Platanthera constricta*, Lindl. in Wall. Cat. 7043. *H. goodyeroides*, Don in Wall. Cat. 7066B. *Herminium constrictum*, Lindl. in Bot. Reg. under t. 1449. *Peristylus constrictus*, Lindl. Gen. and Spec. Orch., 300. *Orchis leucantha*, Herb. Ham.

Sikkim, at Brip, 1,500 feet; King. Valley of the Teesta, at Sivoke, elevation 1,000 feet; in flower during June and July; Pantling No. 447. Khasia Hills, elevation 2,000 to 4,000 feet; Lobb, Griffith (Kew Distrib. No. 5305), Mann. Assam; Jenkins, Masters, Simons. Chittagong; Wallich. Burma (Tenasserim); Helfer (Kew Distrib.) No. 5357, Falconer, Brandis, Kurz, Scott. Upper Burma, at Maymyo; Calcutta Bot. Gard. Collectors No. 124.

The colour of the sepals is pale brown and that of the petals and lip pure white, the spur of the latter being green.

The suppressed stigma in this species is bifid, and a polliniar gland is attached to each half of it.

PLATE 429.—*Habenaria constricta*, Hook. fil. A plant, *of natural size*. Fig. 1 a flower, 2 apex of ovary and column with the globose spur of the lip still attached, showing the anther-cells with their polliniar glands (*p g*), the staminodes (*c*), the stigmas (*s*), and the entrance to the spur (*r*), 3 the lip flattened out, 4 bract, ovary, column and spur, *side view*, 5 section of spur, 6 pollinia; *all enlarged*.

27. HABENARIA GOODYEROIDES, Don Prod. Fl. Nep., 25.

Height of entire plant 12 to 24 in., the *tubers* ellipsoid or oblong, hairy. *Stem* clothed at the base with lax rather blunt sheaths. *Leaves* close together a little below the summit of the stem but not whorled, sub-coriaceous, ovate or ovate-elliptic, acute, slightly narrowed to the shortly sheathing base; somewhat pale on the under surface when dry; length 2 to 4 in., breadth 1·25 to 2 in.; peduncle of the spike naked, except for one or two lanceolate acuminate bracts about ·5 in. long. *Spike* 4 to 8 in. long, many- and densely-flowered. *Flowers* ·3 in. in diam. at the mouth; *floral bract* narrowly lanceolate, acuminate, about as long as the sessile ovary. *Sepals* unequal; the dorsal broadly ovate-lanceolate, concave, conniving with the petals to form a hood; the lateral pair oblong, involute, all apiculate. *Petals* as long as the sepals, trapeziform, blunt. *Lip* longer than the petals, in general outline broadly triangular, but the sides rounded; the anterior third 3-lobed; the middle lobe broad, tapering to the blunt apex; the side lobes linear-oblong, falcate, their apices acute and diverging, slightly longer than the middle lobe; spur short, sub-globular, saccate, much shorter than the sepals; the upper surface of the lip with an oblong speckled nectar-secreting depression at the base in front of the minute opening into the spur. *Column* short, broad. *Anther-cells* parallel, separated by a narrow space, without tubes; *pollinia* broadly pyriform, the caudicles very short, the glands small, obovoid. *Staminodes* large, oblong, at right angles to the anther, but directed outwards. *Stigmas* two, beneath and parallel to the staminodes,

oblong with expanded apices, large. Hook. fil. Fl. Br. Ind. VI, 161 (*in part*). *H. ornithoides*, Wall. MSS. ? *Peristylus grandis*, Blume Bijdr. 405. *Herminium goodyeroides*, Lindl. in Wall. Cat. 7066A (*in part*).

Sikkim, at Mungpoo, elevation 3,000 feet; at Sivoke, 1,000 feet; Pantling No. 231, Anderson No. 1197; in flower from May to July. Nepal; Wallich (at Puspulnath in August). Behar (on Parisnath); T. Anderson. Gharwal, at Mussourie; King. Manipur; Watt 6928. Khasia Hills; Hooker and Thomson, G. Mann, Nos. $\frac{14}{1856}$ and $\frac{38}{1884}$ and 377. Assam; Fisher.

The flowers are sweetly-scented, and they are white or cream-coloured, the sepals being tinged with brown. The infertile stigma in this species also is bifid.

Var. *affinis*, Lindl., Gen. and Spec. Orch., 300. At least a third smaller than the typical form in all its parts; with a rather longer lip, gibbous at the base, and with broader side lobes. *Habenaria affinis*, Don Prod. Fl. Nep. 25. *H. goodyeroides*, in Hook. fil. Fl. Br. Ind., 161. *H. sacculata*, Wall. MSS. *Peristylus goodyeroides*, Lindl. Gen. and Spec. Orch., 299; Royle Illust. Him. Bot., t. 87, fig. 2.

Sikkim, in the western part of the province, at an elevation of 2,000 feet; in flower during June; Pantling No. 453. Nepal; Wallich (at Toka in flower during July) Cat. 7066A. Gharwal; Royle, King. Khasia Hills; Clarke No. 44420; Mann, Nos. 5, 13. Naga Hills; Prain No. 66.

The flowers are usually of the same colour as in the typical form, but occasionally they appear to be more green.

This species and the variety given above were originally described as species by D. Don on specimens which existed in the herbarium of Daniel Bourke Lambert. The original specimens have, however, been lost, and the oldest specimens known to botanists are those which were issued by Wallich as No. 7066A. of his distribution and catalogue (7066B is another species, viz., *H. constricta*). In making his distribution of the orchids of the Wallichian Herbarium, Lindley overlooked Don's *H. affine*, and he distributed both it and *H. goodyeroides* under the name *Peristylus goodyeroides*. Wallich, however, when he collected the plants which Lindley ultimately distributed as 7066A, recognised that they were different. To one set of these, collected in July 1821 at Toka, he gave the MSS. name *Habenaria sacculata*, Wall. To the other, collected at Puspulnath in August of the same year, he gave the name *Habenaria ornithoides*, Wall. A very careful examination of the Wallichian sheets numbered 7066A as they exist in the type set at the Linnæan Society's rooms, in the Herbarium at Kew, and in that at Calcutta, was made by Dr. D. Prain, Curator of the Calcutta Herbarium, whose note on the subject we here reproduce, on account both of its excellence botanically, and of the curious piece of herbarium history which it puts on record. The note is as follows:—

"As I discovered when I consulted the type Herbarium at the Linnæan Society, No. 7066B is really *H. constricta*, Hook. fil. But 7066A turns out, as I had suspected, to be a *mélange* of two gatherings. One of these was got at Toka in July 1821, and in the field Dr. Wallich named it *Habenaria sacculata*; the other was got at Puspulnath, August 1821, and Dr. Wallich named it *H. ornithoides*. Clearly he thought the two different when he gathered them. Both were, however, distributed together when his Herbarium was issued. Luckily for us we have both plants at Calcutta, so that we are in a position to clear up the matter thoroughly. At Kew there is only the August gathering; in Herbarium Lindley, on the other hand, there is only the July gathering of 7066.

"Lindley has in Herb. Linn. Soc. named the whole of 7066A (both gatherings) and B as well, *Peristylus goodyeroides* with his own hand. But he had been more careful with the other specimens; for, on Sir William Hooker's (now Herb. Kew.) example of 7066A from Puspulnath, he wrote only *Peristylus*; and on a specimen of the same thing which he got from Wallich, but which is *not* numbered, he again has written only *Peristylus*. It is only on his own example of Wall. Cat. 7066A, (which is the Toka plant, *H. sacculata*, Wall.), that Lindley has written *Peristylus goodyeroides* in full; and the only other place where he has done so (except in Herb. Linn. Soc., which he has clearly examined carelessly and rapidly) is on the *original drawing* of Royle Ill. 87, fig. 2.

"But at this point our troubles recommence. We have to decide whether *Peristylus goodyeroides*, Lindley, is the same as *Habenaria goodyeroides*, Don (*Prodromus Floræ Nepalensis*, 25). Don published this book from the collections of Buchanan-Hamilton and of Wallich in the Herbarium of Mr. Lambert. But these plants of Wallich's did not form any part of the Wallichian Herbarium which was distributed with numbers; they were in fact sent direct by Dr. Wallich to Mr. Lambert years before Dr. Wallich went home with his big Herbarium. When Mr. Lambert died, his collections were sold. I have seen the auctioneer's list. Most of his fine things from South America, Australia, etc., fetched high prices; some were bought for the British Museum, some for Sir W. Hooker, some for Paris, some for Berlin, etc, etc. But all the bundles 'Nepal Plants—Wallich' went cheap, (2/6, 5/, 6/6 per lot and so on). Not one of the great botanists wanted them; and every single bundle was bought by Mr. Pamplin, the book-seller, for practically the merest trifle. Yet the botanists made a great blunder, for these very bundles contained all the types of Mr. David Don's new species of the *Prodromus Floræ Nepalensis*. Mr. Lambert's sale took place *after* the distribution of Dr. Wallich's great herbarium, and no doubt everybody concerned thought he already possessed everything that *could* be in Lambert's bundles, and that all the names would be the same as on the distributed sheets. As to the first idea, no doubt they were right; as to the second, the less said the better.

"Mr. Pamplin found his speculation a mistake; cheaply as he bought the plants, no one ever wanted to purchase them; and when he gave up business 30 years ago, his Nepalese specimens were, I understand, thrown aside as rubbish. Anyhow I cannot trace them; and there is no specimen of *Habenaria goodyeroides* named by Don either at Kew, the British Museum, in the Herbarium Drake at Paris, or Herbarium De Candolle at Geneva—four of the most likely places to find one.

"After the break-up of Mr. Lambert's collection, Mr. Don was Keeper of the Linnæan Society's Herbarium, and he had gone over the whole of Wallich's Herbarium, and named with his own hand the specimens there of his *Prodromus* species; but, just as luck would have it, *not the orchids*; these he naturally and properly left entirely to Professor Lindley.

"If Don had only described one *Habenaria* of the section *Peristylus*, it would have been an easy matter for us. But he described two. And so it just comes to this: Don saw that Wallich's first impression was right, that the Toka gathering and the Puspulnath one were distinct, and he describes them as different species accordingly.

"Now we know that Wallich collected only *two* forms of *Peristylus* in Nepal, and that these two are distributed together under 7066A; we may, therefore, satisfactorily conclude that these two are just the ones that Don deals with.

"Of their differences we can only say that broadly his *H. goodyeroides* is bigger than his *H. affinis*, and that the colour of the flowers of his *H. goodyeroides* is like that of *H. albida*, viz., 'green.' There is no doubt, therefore, that it is with the plant described by Sir Joseph Hooker (excluding some of the synonyms) that Don's plant agrees best. The smaller plant which is K. and P's. No. 453 becomes then (if we are satisfied that it is equal to *H. sacculata*, Wall. Cat. 7066A., Toka, and equal to *Peristylus goodyeroides* of Royle) *Habenaria affinis*, Don."

PLATE 430.—*Habenaria goodyeroides*, Don. A plant, *of natural size*. Fig. 1 ovary and flower, 2 column with the sac of the lip attached, showing the anthers with the glands of their pollinia (*p g*), the staminodes (*c*), the opening into the spur (*r*), and the stigmas (*s*), 3 lip, 4 bract, ovary, column and spur of lip, *in profile*, 5 section of spur, 6 pollinia; *all enlarged*.

PLATE 430 *bis*.—*Habenaria goodyeroides*, Don, var. *affinis*, Lindl. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary and column (with the sac of the lip still attached), showing the anther-cells and polliniar glands (*p g*), staminodes (*c*), stigmas (*s*) and opening into the spur (*r*), 3 lip, 4 bract, ovary, column and spur of lip, *in profile*, 5 section of spur, 6 pollinia; *all enlarged*.

28. HABENARIA PRAINII, Hook. fil. Fl. Br. Ind. VI, 159.

Height of entire plant 12 to 18 in.; *tubers* irregularly ellipsoid. *Stem* with several wide-mouthed blunt sheaths near the base. *Leaves* three to five, about the middle of the stem, unequal, oblong or ovate-oblong, acute or sub-acute, slightly narrowed to the widely sheathing base, the middle ones the largest; length 1·5 to 2·5 in., breadth ·5 to 1 in. Upper part of stem naked, except for one or two lanceolate bracts about ·5 in. long. *Spike* narrow, 1·5 to 3·5 in. long, with numerous rather crowded flowers about ·15 in. in diam. at the mouth; *floral bract* lanceolate, acuminate, erect, longer than the sessile erect ovary. *Sepals* sub-equal, elliptic, sub-acute, not spreading, the dorsal very concave and the lateral pair more or less so. *Petals* fleshy, somewhat shorter than the sepals, broadly ovate-elliptic, gibbous at the middle on the inner edges, the apex obtuse, the base obliquely cut away on the inner side. *Lip* slightly longer than the sepals, with a small globose sac at the base, concave, 3-lobed; the side lobes short, oblong, their apices blunt, pointing forwards; the apical lobe broadly oblong, blunt. *Column* short and broad. *Anther-cells* parallel, without tubes; *pollinia* obovoid, their caudicles slender and short; the glands orbicular, minute; *staminodes* large, sub-orbicular, situated at the sides of the anther-cells; infertile stigma large, with two broad lobes, a polliniar gland resting on each. *Stigmas* two, oblong-orbicular, situated below the staminodes.

Sikkim, at Mungpo, elevation 3,500 feet; in flower during August; Pantling No. 167. Assam; at Kohima in the Naga Hills; Prain. Cachar; Prazer. Upper Burma; collectors of Calcutta Bot. Garden.

The colour of the flowers is brownish-green.

PLATE 431.—*Habenaria Prainii*, Hook. fil. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary and column, showing the basal sac of the lip (*a*) still attached to the column, and the entrance to the former (*r*), the 2-lobed infertile stigma (*r*), the stigmas (*s*), the staminodes (*g*), and the pollinia with their caudicles and glands, 3 the petals, 4 lip, 5 section of spur, 6 pollinia; *all enlarged*.

29. HABENARIA PSEUDOPHRYS, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 133.

Height of entire plant 18 to 28 in. *Tubers* irregularly oblong, hairy. *Stem* with three or four long convolute acuminate sheaths in its lower part, each from 1 to 1·5 in. long. *Leaves* about four in number, scattered, distant, the lower from 1 to 2 in. long, the upper 3 in. long; all elliptic-oblong, acute, with broad sheathing bases; the peduncle with three or four scattered lanceolate acuminate bracts ·5 to ·75 in. long. *Spike* 3 or 4 in. long; the *floral bracts* lanceolate, equalling or longer than the sessile shortly-beaked ovaries. *Flowers* ·15 in. across. Sepals petals and lip connivent. Dorsal *sepal* broadly elliptic, oblong; the lateral pair oblong, all sub-acute. *Petals* shorter than the

sepals, broadly elliptic, sub-acute, the bases oblique. *Lip* equalling the sepals in length, oblong, concave, the margins entire, the apex 3-lobed; side lobes narrowly triangular, pointed forwards, very near the small triangular blunt terminal lobe. *Spur* small, globular, slightly compressed vertically. *Column* broad, with two unequal triangular incurved wings (?staminodes) along its outer edges. *Anther-cells* close together, parallel; the *pollinia* broadly ovoid, each with a short caudicle and a discoid gland lodged in a pouch. *Stigma* large, extending on each side of the pouches and of the minute mouth of the spur, and concealed partly by the incurved wings of the column.

Sikkim, at Choong-thang, elevation 5,500 feet; in flower during July; Pantling No. 424.

In externals this species resembles *H. Prainii*, Hook. fil., with which it was at first confused. It is, however, perfectly distinct. This plant has the *facies* of a *Habenaria*, but the glands and the bases of the caudicles of the pollinia rest in twin pouches, after the manner of *Ophrys*.

PLATE 432.—*Habenaria pseudophrys*, King and Pantling. An entire plant, *of natural size*. Fig. 1 part of ovary and the flower, 2 bract, ovary, column and lip, *in profile*, 3 the petals, 4 lip, 5 apex of ovary, spur of lip and column, the latter with its lateral wings (? staminodes), the anther-cells, polliniar glands in their pouches (*p r*), stigma (*s*), and entrance to the spur (*e*); *all enlarged*.

30. HABENARIA SECUNDIFLORA, Hook. fil. Ic. Plantar., t. 232.

Whole plant 4 to 10 in. high; *tubers* ellipsoid. *Stem* with a few small sheaths at the base. *Leaves* two or three, remote, linear-oblong to linear, acute, scarcely narrowed to the tubular sheath; length 2 to 5 in., breadth ·2 to ·5 in.; peduncle short, bearing two or three linear-acuminate bracts ·35 to ·65 in. long. *Raceme* 1·5 to 5 in. long. *Flowers* rather crowded, secund, ·35 in. long; *floral bract* lanceolate, acuminate, the edges ciliolate, the lower much longer than the curved tumid almost sessile ovary. *Sepals* sub-equal, lanceolate. *Petals* narrower, linear, sub-acute, falcate, minutely papillose like the lip, connivent with the three sepals to form a hood over the column. *Lip* as long as the sepals, deflexed, triangular-oblong in general outline; the apical half the widest, 3-lobed; its middle lobule the largest, oblong, acute; the lateral lobules triangular, not diverging; *spur* shorter than the ovary or sepals, narrowly funnel-shaped, blunt. *Column* rather long, infundibuliform. *Anther-cells* parallel, touching; *pollinia* oblong-obovoid, tapering to the short stout caudicles; the glands large, lanceolate, acuminate, united along their inner edges for half their length. *Staminodes* oblong, rugulose. Infertile stigma erect, large, 2-lobed, each lobe falcately oblanceolate and forming a flap covering the base of the anther. Fertile *stigmas* conjoined, transversely oblong, forming a horizontal band below the infertile one. Hook. fil. Fl. Br. Ind. VI, 165.

Sikkim, in the Lachoong Valley, at elevations of from 9,000 to 11,000 feet; G. Gammie, Pantling No. 419; in the Chumbi Valley (in Bhotan), King's Collectors; in flower during August and September. Kamaon Himalaya, near Sora; Duthie No. 3421.

The colour of the flowers is pink.

This species resembles *H. urceolata* in having united stigmas and secund inflorescence, but it differs from *H. urceolata* in having all its perianth, except the lip, connivent to form a hood over the column, which in this, moreover, is blunt instead of acute. And

in its united polliniar glands this differs not only from *H. urceolata*, but from every species of *Habenaria* described in this work.

PLATE 433.—*Habenaria secundiflora*, Hook. fil. An entire plant, *of natural size*. Fig. 1 a flower, 2 bract, ovary and flower, *in profile*, 3 the petals, 4 lip, 5 column showing the anther-cells, staminodes (*c*), infertile stigma (*r*), polliniar glands (*p g*), and stigma (*s*), 6 section of spur, 7 pollinia; *all enlarged*.

88. Herminium, Linn.

Erect terrestrial tuberous rooted herbs of small size. *Leaves* solitary or few, cauline or radical, sheathing at the base. *Flowers* in spikes, green. *Sepals* sub-equal, free, or the dorsal conniving with the petals to form a hood, the lateral pair spreading. *Petals* usually smaller than the sepals, connivent or spreading, sometimes fleshy, always entire. *Lip* adnate to the base of the column, as long as or longer than the sepals, often fleshy, broad or narrow, entire or 3- or 5-fid, the base concave or very shortly saccate, the upper surface sometimes with calli or pits near the base. *Column* very short; *anther-cells* adnate to its face, parallel, or slightly divergent below; *pollinia* two, the caudicles usually short or sometimes absent; the glands small and orbicular or elliptic, or large hollow and horn-like. *Staminodes* two, rugulose, attached outside the anther-cells. *Stigmas* two, distant or conjoined. Species 13, all Indian and all montane or alpine.

Herminium is distinguished from *Habenaria* chiefly by the absence of a spur or by its small size when present; as also by the small size of the plants. All the species have green flowers.

Lip much longer than broad, not fleshy.
- Lip oblong, deeply 3-lobed near the apex; pollinia pyriform; their caudicles very short, slender . . . . . 1. *H. angustifolium.*
- Lip 5-lobed, the basal lobes always minute, the lateral lobes near the apex sometimes elongate; pollinia ovoid, their caudicles short, stout . . . . . 2. *H. quinquelobum.*
- Lip 3-lobed, the lateral lobes near the base and very minute; pollinia wedge-shaped, sessile . . . . . 3. *H. Jaffreyanum.*
- Lip not lobed; narrowly oblong-triangular.
  - Lip broad at the base and with two deep oval pits; pollinia sessile . . . . . 4. *H. pugioniforme.*
  - Lip not pitted at the base.
    - Column with two pits, not winged; pollinia with caudicles . . . . . 5. *H. gracile.*
    - Column winged in its lower half . . . . . 6. *H. angustilabre.*

Lip not much longer than broad, fleshy.
- Lip triangularly ovate-lanceolate, blunt, the basal half broad, and with long narrow crenulate side lobes; the upper surface with two minute calli near the orifice of the spur; polliniar glands large and horn-like . . . . . 7. *H. congestum.*
- Lip not lobed.
  - Lip broadly ovate, shortly and bluntly acuminate, the edges sub-crenulate, the base with a semi-lunar pit and two thickened lines; polliniar glands horn like, large . 8. *H. Josephi.*
  - Lip ovate-orbicular, gibbous towards the base, with no calli or pits on its upper surface . . . . . 9. *H. orbiculare.*

1. Herminium angustifolium, Benth. MSS. ex Hook. fil. Fl. Br. Ind. VI, 129.

Whole plant 10 to 30 in. high; *tubers* small, oblong or ellipsoid. *Stem* clothed in its lower part with tubular acute sheaths. *Leaves* two or three, long, linear, acuminate, not narrowed to the long sheath; length 2 to 10 in., breadth ·15 to ·5 in. Stem above the leaves short, usually bearing a linear acuminate bract. *Spike* cylindric, narrow, 2·5 to 10 in. long, many-flowered. *Flowers* (to the end of the lip) about ·3 in. long, crowded; *floral bract* linear-lanceolate, acuminate, shorter than or as long as the ovary. *Sepals* sub-equal, oblong, obtuse, the dorsal connivent with the petals to form a hood over the column, the lateral pair spreading. *Petals* as long as the sepals, but very narrowly linear. *Lip* much longer than the sepals, deflexed from the base, oblong in general outline; the lower half minutely auriculate and with a small concavity at the base; the anterior half trifid at its apex, the middle lobe very short; the side lobes long, filiform, curved. *Anther-cells* parallel, close together; *pollinia* pyriform, with rather blunt bases and very short slender caudicles; *glands* small, discoid; staminodes large. *Stigmas* two, transversely oblong, lying close together end to end below the anther-cells. *Aceras angustifolia*, Lindl. in Wall. Cat. 7061; Gen. and Spec. Orch. 282; Bot. Reg. under t. 1525; in Journ. Linn. Soc. III, 43; Royle Ill. Bot. Him. t. 87; Wight Ic. t. 1691. *H. longicruris*, Wright in Mem. Acad. Philad., Ser. 2, VI, 141. *Thisbe*, Falc. in Lindl. Veg. Kingd. 183c (*name only*).

Sikkim, common at elevations of from 4,500 to 9,000 feet or upwards; in flower during July and August; Pantling No. 44. Westwards along the chain to Gharwal. Bhotan, Khasia Hills, Naga Hills, Tenasserim. Distrib.—China, Japan, Manchuria.

The flowers are of a uniform green colour.

Plate 434.—*Herminium angustifolium*, Benth. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 upper part of ovary, column with anther *in situ* and lip, 3 apex of column and base of lip, anther-cells with the pollinia and their appendages, staminodes and stigmas, 4 pollinia; *all enlarged*.

2. Herminium quinquelobum, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 130.

Entire height of the plant 4 to 12 in.; *tubers* oblong, undivided, about 1 in. long. Lower part of *stem* enveloped in two long convolute sheaths. *Leaves* two, rising from about the middle of the stem, linear-oblong, sub-acute, 6 or 7 in. long and ·5 to ·6 in. broad; stem above the leaves with a single linear bract 1·5 in. long. *Spike* 1·5 to 4 in. long, rather laxly-flowered. *Flowers* ·25 in. across to end of lip; the *floral bract* lanceolate, as long as the shortly-beaked ovary. *Sepals* sub-equal, free, ovate-oblong, sub acute, spreading. *Petals* linear-acuminate, spreading and, like the sepals, 1-nerved. *Lip* longer than the sepals, oblong with small triangular basal auricles besides lateral lobes and a contracted triangular acuminate terminal lobe; the lateral lobes near the apex, and sometimes elongate. *Column* broad. *Anther-cells* discrete, parallel; *pollinia* broadly ovoid, blunt at each end, the caudicles short and stout, the glands discoid. *Staminodes* oblong. *Stigmas* two, transversely oblong, lying between the polliniar glands and the concavity of the lip, their ends close together but not united.

Sikkim, at Tendong, elevation 7,000 feet; in flower during August; Pantling No. 339. Also at Tankra, elevation 9,500 feet; G. Gammie. Sinchal; King. Darjeeling; Clarke, Thomson.

A species like *H. angustifolium*, Benth., in general appearance; but the flowers have a totally different lip and the sepals are spreading and free, those of *H. angustifolium* being connivent. This has been named from its 5-lobed lip. Its flowers are green.

PLATE 435.—*Herminium quinquelobum*, King and Pantling. A plant, *of natural size.* Fig. 1 bract, ovary and flower, 2 pollinia, *of natural size.*

3. HERMINIUM JAFFREYANUM, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 130.

Entire plant 4 to 8 in. high; the *tuber* ellipsoidal. *Stem* with one or two short convolute sheaths near the base. *Leaves* two, about an inch apart, from near the middle of the stem, narrowly oblong, acute, broad and sheathing at the base, 4 to 4·5 in. long and ·3 to ·5 in. broad; stem above the leaves with a linear acuminate bract 1·5 in. long. *Spike* 1·5 to 3 in. long, densely-flowered; the *floral bract* lanceolate, about as long as the ovary. *Flowers* ·15 in across. *Sepals* broadly ovate-elliptic, blunt, concave, spreading slightly. *Petals* spreading, narrowly oblong, obtuse, longer than the sepals, 1-nerved. *Lip* flat, narrowly oblong-triangular from a broad base; basal lobes very small, short, rounded; the terminal lobe elongate, tapering to the blunt apex. *Column* short, broad. *Anther-cells* discrete, parallel; *pollinia* wedge-shaped, without caudicles; *stigmas* united, transversely oblong.

Sikkim, common at elevations of from 8,000 to 10,000 feet; in flower during August; Pantling No. 237.

In externals this resembles *H. angustifolium*, Benth., with which indeed it has been confounded. It has, however, very different sepals and lip. This also resembles *H. gramineum*, Lindl., which, however, has only a single leaf; the lip of *H. gramineum*, moreover, is ovate-acuminate and concave, and its flowers have longer and more subulate bracts. This also resembles *H. quinquelobum*, King and Pantling, but has sessile pollinia and a different lip. The flowers are green.

PLATE 436.—*Herminium Jaffreyanum*, King and Pantling. A plant, *of natural size.* Fig. 1 a flower, 2 pollinia; *all enlarged.*

4. HERMINIUM PUGIONIFORME, Lindl. MSS. ex. Hook. fil. Fl. Br. Ind. VI, 130.

Height of entire plant 2 to 7 in.; *tuber* small, globular. *Stem* with one or two minute sheaths at the base. *Leaf* solitary, sub-radical, oblong-oblanceolate, sub-acute or obtuse, slightly narrowed to the very short sheath; length ·65 to 1 in., breadth ·35 to ·5 in.; stem above the leaf elongate, naked. *Spike* ·35 to 1·75 in. long, laxly-flowered. *Flowers* minute, only about ·05 in. across; *floral bract* broadly ovate, shorter than the tumid ovary. *Sepals* unequal; the dorsal broadly ovate, forming a hood over the column with the petals; the lateral pair rather longer than the dorsal, falcately oblong, obtuse. *Petals* concave, rotund, their edges crenulate. *Lip* as long as the lateral sepals; the base much expanded, fleshy and excavated into two deep oval parallel pits; the anterior part linear-oblong sub-terete. *Anther-cells* discrete, their apices touching, their tubes diverging; *pollinia* elliptic, slightly clavate, tapering somewhat (without having definite caudicles) to the elliptic glands; *staminodes* oblong with obtuse ends. *Stigmas* conjoined, lying between the polliniar glands.

Sikkim, on Sin-ga-le-la, at an elevation of about 12,000 feet; in flower during July; Pantling No. 374; also in the Gharwal-Himalaya; Duthie No. 517.

The colour of the flowers is green.

PLATE 437.—*Herminium pugioniforme*, Lindl. Three plants, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary, with column and lip showing the anther-cells (*a*), the tubes and glands of their pollinia (*p g*), and the staminodes (*s*); *all enlarged*.

5. HERMINIUM GRACILE, King and Pantling in Journ. Linn. Soc., Vol. LXV, Pt. 2, 131.

Height of entire plant 4 to 7 in. *Stem* angled, with one or two blunt wide sheaths near its base. *Leaf* solitary, ovate, obovate, oblanceolate or elliptic with a short sheathing petiole, blunt or sub-acute; length ·5 to 1·5 in., breadth ·5 to ·65 in.; petiole ·1 in. Peduncle naked; *spike* ·5 to 1·5 in. long, sparsely-flowered. *Flowers* ·1 in. long, their *bracts* lanceolate, as long as the pedicel of the tumid ovary. Dorsal *sepal* broadly ovate, obtuse, concave; the lateral pair concave at the apex, oblong, blunt, deflexed. *Petals* broadly oblong, very concave, as large as the dorsal sepal and with it forming a hood over the column. *Lip* narrowly oblong-triangular, its base continuous with the column, not lobed, the apex sub-acute, bent about the middle, the basal half directed downwards and the apical half forwards. *Column* hooded, the third or modified stigma occupying a large transverse area above the two fertile stigmas. *Anther-cells* distant, each having a depressed elliptic fertile stigma on its inner side; *pollinia* broadly ovoid, their caudicles bent at a right angle, and each attached to a small brown gland; *staminodes* small, oblong, attached to the fertile anthers near their caudicles at the outer sides.

Sikkim, in the Lachen valley, at an elevation of about 11,000 feet; in flower in July; Pantling No. 397.

This species has a superficial resemblance to *H. orbiculare*, Hook. fil. The flower in that species has, however, a lip with a short spur, and the column is very simple; whereas in this plant there is no trace of spur, and the structure of the column is very complicated.

PLATE 438.—*Herminium gracile*, King and Pantling. Two plants, *of natural size*. Fig. 1 front view of a flower, 2 front view of bract, ovary, column and lip (*the latter flattened out*), showing the third or infertile stigma (*a*), anther-cells (*b*), polliniar gland (*p.g*), staminode (*s*), the fertile stigmas (*b*), 3 the petals, 4 pollinia; *all enlarged*.

6. HERMINIUM ANGUSTILABRE, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 131.

Height of the whole plant 3 or 4 inches. *Stem* angled. *Leaf* solitary near the base of the stem, sessile, elliptic, obtuse, ·65 in. long and ·35 to ·45 in. broad, the part of the stem above the leaf with two linear-lanceolate acuminate bracts ·5 in. long. *Spike* ·75 to 1 in. long. *Flowers* ·1 in. across; *floral bract* acuminate, longer than the sessile beaked ovary. Dorsal *sepal* broadly ovate, acute, concave, curved forwards; lateral sepals and petals sub-equal, narrowly oblong, the former deflexed. *Lip* slightly exceeding the lateral sepals, linear, deflexed, sub-acute, entire. *Column* winged in its

lower half. *Anther-cells* small, distant, parallel. *Stigmas* conjoined, forming a transverse band across the column.

Sikkim, at Ling-tu and Sin-ga-le-la, at elevations of 11,000 to 12,000 feet; in flower during July; Pantling No. 375.

The colour is green throughout.

PLATE 439.—*Herminium angustilabre*, King and Pantling. Three plants, *of natural size*. Fig. 1 a flower, 2 bract, ovary, column and lip, *in profile*, 3 apex of ovary, base of the lip and the column, the latter bearing the anther-cells and stigma, 4 sepals and petals, separated; *all enlarged*.

7. HERMINIUM CONGESTUM, Lindl. in Wall. Cat. No. 7068; Gen. and Spec. Orch., 305.

Entire plant 3 to 7 in. in height; *tuber* ovoid-globose, hairy. *Stem* with one or two short blunt wide sheaths at the base. *Leaves* two or three, rising close together near the base, narrowly oblong-elliptic, sometimes slightly oblanceolate, sub-acute or obtuse, slightly narrowed to the usually short sheath; length 1·25 to 4 in., breadth ·3 to ·65 in.; stem above the leaves with a single linear bract, often naked. *Spike* narrow, ·5 to 2·5 in. long, many-flowered. *Flowers* ·15 in. across, drooping (from the curving of the ovary); *floral bract* ovate, acute, very much shorter than the beaked ovary. *Sepals* sub-equal, obtuse; the dorsal broadly ovate; the lateral narrower, oblong, sub-acute, slightly spreading. *Petals* as long as the sepals or a little longer, obliquely triangular-lanceolate, acute. *Lip* longer than the sepals, fleshy, triangularly ovate-lanceolate, blunt, the base triangular; sides lobes very narrow, crenulate, the apical lobe quite entire, the upper surface with two small calli at the mouth of the minute globose saccate spur; *pollinia* broadly ellipsoid with blunt ends, the caudicles very short; the glands oblique, horn-like; *staminodes* oblong with tapering ends. *Stigmas* two, situated behind the caudicles of the *pollinia* and above the entrance to the minute sac-like spur. *Capsule* ·25 in. long. Lindl. in Journ. Linn Soc. III, 43; Hook. fil. Fl. Br. Ind. VI, 130. *H. unalaschcense*, Reichb. fil. Ic. Fl. Germ. XIII, 107, t. 418. *H. Schischmareffiana*, Chamiss. in Linnæa. III, 29. *Platanthera Schischmareffiana*, Lindl. Gen. and Spec. Orch., 286. *Neottia macrophylla*, Don Prodr. 27. *Spiranthes macrophylla*, and *S. unalaschcensis*, Spreng. Syst. III, 708.

Sikkim, common at elevations between 10,000 and 12,500 feet; in flower during July and August; Pantling No. 384. Westward to Nepal. Distrib. Aleutian Islands.

The colour of the flowers is green.

PLATE 440.—*Herminium congestum*, Lindl. A plant, *of natural size*. Fig. 1 a flower, 2 minute bract, beaked ovary, column and lip with its minute globular spur, 3 lip, upper surface, 4 the petals, 5 column, showing the anther-cells, polliniar glands (*p g*), staminodes (*s*), and the orifice of the spur (*e*), 6 pollinia; *all enlarged*.

8. HERMINIUM JOSEPHI, Reichb. fil. in Flora LV (1872), 276.

Entire plant 4 to 10 in. in height; *tuber* sub-globose. *Stem* with a lax blunt sheath at the base. *Leaves* two, from near the base, sub-opposite (sometimes only one), narrowly elliptic-oblong, acute, narrowed to the long sheath. Peduncle of spike naked. *Spike*

1 to 2 (rarely 2·5) in. long, rather densely-flowered. *Flowers* ·35 in. across; *floral bract* oblong, sub-acute, smaller than the shortly-beaked ovary. *Sepals* unequal, the dorsal broadly ovate-elliptic with blunt apex and broad truncate base; the lateral pair longer, oblong, tapering to the sub-acute apex, falcate, sub-erect, not spreading. *Petals* triangular-lanceolate, sub-acute, longer than the sepals, and conniving with them into a hood. *Lip* flat, fleshy, rather longer than the lateral sepals, shortly and broadly clawed, broadly ovate, shortly and abruptly acuminate, the edges sub-crenulate but not lobed; the upper surface with a small semi-lunar pit at the base near the column and two inclined plates (with their margins touching) extending from it to beyond the middle. *Column* very broad at the base, tapering upwards. *Anther-cells* touching by their apices, their bases diverging, tubes none. *Pollinia* ellipsoid, blunt at both ends, deeply 2-cleft, each inserted by a very short flat elastic caudicle into a large curved horn-like hollow gland. *Staminodes* oblong. *Stigmas* two, oblong, obtuse, transverse, lying above the orifice of the spur, their inner ends separated by the base of a large triangular hastately-lobed space lying between the anther-cells. Hook. fil. Fl. Br. Ind. VI, 129. *H. grandiflorum*, Lindl. MSS. in. Herb. Hook. fil. and T. Thoms.

Sikkim, in the Lachen Valley; also in the Chumbi Valley in Bhotan; at elevations of from 11,000 to 12,000 feet; Pantling No. 381; also on the Cho-la and Pan-ka-la; in flower during June and July.

The flowers are green throughout. The transverse lobes of the hastate space between the anther-cells may represent the rostellum, but the nature of the rostellum in this genus, as in *Habenaria*, appears to be at present so obscure that we prefer to describe nothing under the name of rostellum.

PLATE 441.—*Herminium Josephi*, Reichb. fil. A plant, *of natural size*. Fig. 1 a flower, 2 column with the base of the lip still attached, anther-cells (empty) (*a*), staminodes (*b*), stigmas (*s*), entrance to spur (*g*), triangular hastate space between the anther-cells (*r*), 3 sepals and petals, detached and spread out, 4 bract, beaked ovary and bases of perianth, 5 lip, upper surface, 6 pollinia; *all enlarged*.

9. HERMINIUM ORBICULARE, Hook. fil. Ic. Plantar., t. 2199B.

Whole plant 3 to 6 in. high; *tuber* thin and elongate. *Leaves* variable, all radical or all cauline, or scattered, or sometimes obsolete, elliptic-oblong with white reticulations, or linear-oblanceolate and entirely green, sessile or with a rather long sheath; length ·5 to ·85 in., breadth ·15 to ·4 in. Peduncle of spike slender, elongate, bearing a few distant subulate bracts about ·25 in. long; *spike* ·5 to 1 in. long, rather densely-flowered. *Flowers* about ·1 in. across (to end of lip); *floral bract* oblong-lanceolate, blunt, shorter than the sessile somewhat tumid oblique ovary. *Sepals* sub-equal, oblong, blunt, the dorsal broader than the lateral pair. *Petals* shorter than the sepals, sub-orbicular, elliptic, blunt. *Lip* slightly longer than the sepals, ovate-orbicular, entire, blunt, gibbous towards the base, slightly concave, minutely glandulose near the thickened apex; spur minute, cylindric, with a thick ridge inside on its posterior surface. *Anther-cells* parallel; *pollinia* broadly ovate, the caudicles very short; glands small, orbicular. *Stigmas* conjoined under the anther-cells. Hook. fil. Fl. Br. Ind. VI, 130.

Sikkim, in the Sin-ga-le-la range, elevation about 12,000 feet; in flower during July; Pantling No. 348. Chumbi valley in Bhotan. Lachong valley; G. Gammie No. 1031. Esa-naugi in Nepal.

The colour is green throughout.

PLATE 442.—*Herminium orbiculare*, Hook. fil. A plant, *of natural size*. Fig. 1 bract, ovary and flower, 2 apex of ovary and column, showing the pollinia *in situ* and the stigma, 3 the petals, 4 lip, 5 section of spur, 6 pollinia; *all enlarged*.

89. Diplomeris, Don.

Small terrestrial deciduous herbs, with or without tubers. *Leaves* few, large, oblong or ensiform, hairy or glabrous. *Flowers* one or two, large. *Sepals* sub-equal, free, lanceolate, spreading. *Petals* much larger than the sepals. *Lip* adnate to the base of the column by a long claw, its limb spreading, very broad, entire or minutely 3-lobed at the apex, with a long spur. *Column* very short; infertile stigma large, erect, membranous, standing in front of the anther-cells. *Anther-cells* parallel, with very long tubes extending horizontally forwards by the sides of the column and projecting in front of it; *pollinia* sub-cylindric, curved; the caudicles very long, cylindric, curved; glands minute, discoid. *Stigmas* two, much elongate, oblong, parallel, projecting downwards and forwards above the claw of the lip. Species two, both Indian.

DIPLOMERIS HIRSUTA, Lindl. Gen. and Spec. Orch., 331.

Tuber globose; *stem* very short, 1-flowered. *Leaf* solitary (with sometimes the rudiment of a second), radical, pendulous, oblong, sub-acute, the base minutely cordate, sessile, bearing stiff scattered hairs on both surfaces; length 2 to 3·5 in., breadth ·75 to 1·15 in. *Flower* 1·25 to 2 in. long and ·9 in. to 1·4 in. across in front; *floral bract* ovate, acute, sparsely pubescent like the ribbed ovary. *Sepals* ovate-oblong, sub-acute, much smaller than the petals. *Petals* orbicular-reniform, the apex slightly acute. *Lip* somewhat longer than the sepals, sub-orbicular, abruptly clawed at the base; the apex broad, emarginate, mucronate in the sinus from the projection of the thick midrib; upper surface smooth, the midrib broad and somewhat thickened; *spur* infundibuliform at the mouth, otherwise cylindric, slightly compressed, curved, pubescent inside, three or four times as long as the ovary. *Column* short; the infertile stigma very large, thin, erect, ovate-rotund with irregularly lobed edges, its surface concave. *Anther-cells* lying one on each side of and behind the imperfect stigma, triangular, with very long horizontal forward-pointing tubes; *staminodes* small, oblong, rugulose, each borne at the lower part of the outer surface of the anther-cell; *pollinia* cylindric, blunt, curved; the caudicles very long and curved; glands small, discoid. Fertile *stigmas* two, oblong, blunt, lying parallel to and connate with each other by their inner edges below the orifice of the spur and overhanging the claw of the lip. Hook. fil. Fl. Br. Ind VI, 167. *Diplochilus hirsuta,* Lindl. in Wall. Cat. 7065; in Bot. Reg. under t. 1499.

Sikkim, in the valley of the Teesta, at elevations of about 1,000 to 1,400 feet; on sandstone rocks; in flower from June to August; Pantling No. 184. Bhotan; Lister, Gammie. Nepal; Wallich.

The flowers are pure white and are very beautiful. Morphologically they are of extreme interest because in them a theory of the structure of the flower of *Ophrydeæ*,* suggested with various degrees of distinctness in the different species of *Habenaria*, is indicated with comparative clearness. The superior (sterile) stigma stands quite separate from the other two (fertile) stigmas, and equally so from the anther-cells. It forms a large smooth concave erect termination to the column, while the two other stigmas form two elongate parallel processes overhanging the claw of the lip, conjoined by their edges in the lower half, but with their anterior halves free and curved downwards. At each side of and behind the infertile stigma lies a triangular anther-cell, bearing on its exterior surface the staminode which, on this theory, is regarded as the rudiment of its second cell. The tubes of the perfect cells pass horizontally outside and along the sides of the infertile stigma and project horizontally far beyond it, each containing a caudicle which bears on its extremity the viscid gland. This gland is quite unconnected with the walls of the tube. From these structural arrangements the following conclusions are by this theory deduced: (*a*) that in *Diplomeris* there are two anthers, one placed on each side of the posterior or infertile stigma; (*b*) that the staminode represents the second cell of each anther; (*c*) that the viscid glands of the pollinia are not, in the expanded flower, connected with the infertile stigma.

PLATE 443.—*Diplomeris hirsuta*, Lindl. Four entire plants growing on a stone, *of natural size*. Fig. 1 profile view of bract, ovary, base of lip (*l*) and spur, and the column showing the superior (infertile) stigma (*r*), perfect stigmas (*s*), anther-cells (*a c*) and their polliniar glands (*p g*), 2 front view of the base of the lip (*l*), imperfect stigma (*r*), perfect stigmas (*s*), polliniar glands (*p g*) and orifice of the spur (*c*), 3 section of spur, 4 pollinia; *all enlarged*.

90. Satyrium, Swartz.

Terrestrial leafy erect herbs with undivided tubers. *Leaves* (in the Indian species) large, flaccidly membranous, with wide sheaths (orbicular in the S. Indian specimens). *Flowers* in dense spikes. *Sepals* and *petals* sub-similar, free, spreading or reflexed. *Lip* superior, (from the ovary not being twisted), adnate to the base of the column, erect, broad, hood-shaped, 2-spurred (in the Indian species) or 2-saccate. *Column* much arched, terete. *Stigma* single, large, convex or concave, borne on the upper lobe of the column. *Anther-cells* dorsal or lateral (lateral in the Indian species), tumid, sub-parallel, their tubes at a lower level than the stigma, pointing forward; *pollinia* two, the caudicles curved, ending in two large naked (sometimes connate) glands; species mostly African, only a few Asiatic.

SATYRIUM NEPALENSE, Don Prodr. Fl. Nep. 26.

Whole plant 20 to 30 in. high; *tuber* ellipsoidal, bearing stolons each with a small tuber at its end. *Stem* glabrous, sheathed near the base; upwards bearing two or three leaves and, above these, several sub-tubular, lanceolate-oblong, acute or acuminate bracts. *Leaves* somewhat fleshy, narrowly elliptic, sub-acute, the bases broad and sheathing; length 4 to 10 in., breadth 1·5 to 3·5 in. *Spike* 2 to 6 in. long. *Flowers* ·3 in. in diam. at the mouth; *floral bract* oblong-lanceolate, acuminate, deflexed, much longer than the flower and turgid ovary. *Sepals* linear-oblong, obtuse, ciliolate, recurved. *Petals* narrower than the sepals, entire, obtuse. *Lip* superior, broadly-oblong, hooded, strongly

* See introduction.

keeled on the back; spurs varying in thickness and length, usually twice as long as the ovary (quite short in var. *ciliata*). *Column* curved, contracted at the base, expanded at the apex. *Stigma* projecting forwards above the anther, convex, anticous. *Anther-cells* turgid, distant from each other, sub-parallel on the sides of the column at a lower level than the stigma; *pollinia* two, pyriform, bipartite, each ending rather abruptly in a slender curved caudicle directed downwards and forwards, and terminated by a thick discoid gland. *Staminodes* rugulose, hemispheric, situated on the upper sides of the anther-cells; rostellum broadly and bluntly triangular, having the anther-cells at its upper corners. Lindl. Gen. and Spec. Orch. 340; in Journ. Linn. Soc. III, 44; Wight Ic. t. 929; Bot. Mag., t. 6625; Wall. Cat. 7025; Hook. fil. Fl. Br. Ind. VI, 168. *S. Perrottetianum*, A. Rich. in Ann. Sc. Nat., Ser. 2, XV, 76, t. 53; Wight Ic. t. 1716. *S. albiflorum*. A. Rich. l. c.; Wight Ic. t. 1717. *S. pallidum*, A. Rich. l. c.

Sikkim and Bhotan, very common at elevations of from 8,000 to 10,000 feet; in flower during September and October; Pantling No. 464. Distributed westwards along the range to Kashmir, where it descends to 4,000 feet; Khasia Hills, about 6,000 feet; the hill ranges of Southern India; Upper Burma.

Var. CILIATA; whole plant under a foot in height; spurs of lip shorter than the boldly ciliate *sepals; petals* erose; *stigma* convex, over-arching, hispid; rostellum truncate; caudicles exceeding in length the cleft pollinia. *S. ciliatum*, Lindl. Gen. and Spec. l. c. 341.

In Sikkim and Bhotan at the same elevations as the typical form and growing intermixed with it; Pantling No. 297.

The usual colour of the flowers is rose-pink, but occasionally it is pure white. The flowers smell faintly of musk. In the Nilgiri and other of the hill ranges of Southern India a form occurs with a much shorter and very densely-flowered spike and with broad radical leaves. This has been separated off as a variety under the name *Wightiana*. It is never found in Sikkim, where the variety named *ciliata* is very common.

PLATE 444.—*Satyrium nepalense*, Don. Parts of a plant, *of natural size*. Fig. 1 a flower with its deflexed bract, 2 view of the back of a flower showing the two spurs, 3 apex of ovary and column, seen from the *front* (the sepals and petals having been removed), showing the anther and the glands of its pollinia, the stigma (*s*), and the rostellum (*r*), 4 pollinia; *all enlarged*.

PLATE 444 *bis*.—*Satyrium nepalense*, Don, var. *ciliata*. An entire plant, *of natural size*. Fig. 1 a flower with its bract, *front view*, 2 flower and ovary, *back view*, 3 apex of ovary and column, the two petals (*p l*) and the dorsal sepal (*s l*) in position, the rostellum (*r*), anther-cells (*p*), gland of a pollen-mass (*g*), stigma (*s*), and staminode (*c*), 4 pollinia; *all enlarged*.

Tribe VII.—CYPRIPEDIEAE.

Perfect anthers two, one on each side of the conjoined stigmas. Staminode single, large, fleshy; lip large, saccate.

91. Cypripedium, Linn.

Terrestrial herbs, stemless or with a leafy annual stem. *Leaves* coriaceous, evergreen, smooth and often coloured; or membranous, deciduous and plicate. *Flowers* large,

usually solitary (rarely in pairs), borne on a scape or at the apex of the leafy stem. *Sepals* spreading, valvate or imbricate in æstivation, the dorsal large, erect; the lateral pair smaller, narrower, and usually connate under and behind the lip. *Petals* free, varying in shape; often very long. *Lip* sessile with small narrow auricle-like often inflexed side lobes and a large inflated saccate mid-lobe. *Column* short, terete; *anthers* two, sub-globose, the cells parallel, contiguous, pollen viscid or glutinous. *Stigma* forming a convex often rugulose disc, deflexed and hidden by the large disciform fleshy staminode. Ovary 1-celled. Species about 80; temperate and tropical Asia and America, also in Europe.

SUB-GENUS I.—*Paphiopedilum.*—Stemless; leaves perennial, coriaceous, evergreen, crowded near the ground, often coloured; flower solitary on a long scape; perianth deciduous; sepals imbricate in æstivation, the dorsal infolding the lateral pair . . . . . 1. *C. venustum.*

SUB-GENUS II.—*Eu-cypripedium.*—Leaves membranous, plicate, deciduous, borne on a more or less elongated annual stem; flowers at the apex of the stem, usually solitary, marcescent; sepals valvate in æstivation.

Leaves two, opposite . . . . . 2. *C. elegans.*

Leaves more than two, alternate.

Floral bract cymbiform, opening of the spur oblong; staminode deeply cordate at the base, the auricles angled, its upper surface with a vertical ridge . 3. *C. tibeticum.*

Floral bract flat, opening of the spur irregularly orbicular, not oblong; staminodes shortly cordate at the base, the auricles rounded, the upper surface not ridged . . . . . 4. *C. himalaicum.*

1. CYPRIPEDIUM VENUSTUM, Wall. in Bot. Mag., t. 2129; Cat. 7023.

Leaves five to seven, elliptic-oblong, somewhat loriform, acute and minutely bifid at the apex, dark green, marbled with pale green above and dull purple beneath, thick in texture, sheathing at the base; length 4 to 10 in., breadth 1 to 2 in. Peduncle nearly twice as long as the leaves, terete, puberulous, usually only 1-flowered (sometimes 2-flowered). *Flower* 2 to 2·5 in. in diam.; *floral bract* oblong, acute, tubular, only half as long as the ribbed ovary. *Sepals* imbricate in æstivation, the dorsal broadly ovate or cordate, acute, erect, somewhat concave; the lateral pair much narrower, lanceolate, united under the lip. *Petals* longer than the dorsal sepal and lip, spreading horizontally, linear sub-spathulate, the lower edge rounded, the upper reflexed near the apex, the edges ciliate except at the reflexed part, the inner surface with seven parallel nerves, sparsely warted and pubescent. *Lip* longer than the dorsal sepal, sub-cylindric, the edges of its mouth reflexed. *Staminode* broadly semi-lunar, notched at the middle of the upper edge. Lindl. Gen. and Spec. Orch. 530; Hook. Exot. Flor., t. 35; Bot. Mag., t. 2129; Bot. Reg., t. 788; Reichb. Fl. Exot. 100; Lodd. Bot. Cab., 585; Warner Sel. Orch. II, t. 24; Veitch Man. 53; Hook. fil. Fl. Br. Ind. VI, 173. Kräntzlin Orch. Gen. et Spec. I, 86. *C. pardinum*, Reichb. fil. in Gard. Chron. (1869), 554; and 1887, I, 382, fig. 76 (var. *pardina*).

Sikkim, in tropical valleys ascending to 4,000 feet; flowering during February and March; Pantling No. 253.

The dorsal sepal is white with dark green vertical stripes; the petals are green and purplish with a few black spots; the lip is yellowish-green flushed with pink and beautifully reticulated with green; the inflexed lateral edges which partially close the mouth are yellow.

PLATE 445.—*Cypripedium venustum*, Wall. A plant, *of natural size*. Fig. 1 front view of the staminode and stigma, 2 profile view of the same; *both enlarged*.

2. CYPRIPEDIUM ELEGANS, Reichb. fil. in Flora 1886, 560.

Height of the entire plant not exceeding 4 in. *Stem* and peduncle pubescent, the former bearing at the base a lax tubular acute sheath, and at the apex a pair of opposite almost orbicular, sessile, puberulous, plicate leaves from 1·25 to 1·5 in. in diam. *Scape* shorter than the leaves, bearing a single flower 1 in. in diam. vertically at the mouth and ·65 in. horizontally; *floral bract* ·75 in. long, ovate-lanceolate, puberulous, much longer than the short ovary and equalling the flower. Dorsal *sepal* narrowly ovate; the lateral pair united under the lip to form a body wider than the dorsal sepal. *Petals* lanceolate, concave, spreading slightly, but their apices curving slightly inwards. *Lip* shorter than the sepals, depressed, the sides abruptly infolded, the upper surface with three parallel crenulate wavy ridges proceeding from the mouth to the apex and uniting there, the apical part of the cavity of the lip with a fleshy plate extending from the upper to the lower wall and dividing it into two loculi. *Staminode* transversely elliptic. *Stigma* pyriform in outline, hispid. Hook. fil. Fl. Br. Ind. VI, 169. Franchet Cypriped. Asie Occ. et Orient., 15; Kräntzlin Orch. Gen. et Spec. I, 30.

Sikkim, in the Lachen Valley, elevation 10,000 feet; in flower during July; Pantling No. 387.

The colour of the flowers is brownish, with darker lines of the same colour.

PLATE 446.—*Cypripedium elegans*, Reichb. fil. Two plants, *of natural size*. Fig. 1 front view of the lip, 2 vertical section of the lip to show one of the inflexed sides and the partition which divides the apical portion into two imperfect chambers, 3 front view of staminode and anthers, 4 profile view of the same; *all enlarged*.

3. CYPRIPEDIUM TIBETICUM, King ex Rolfe in Journ. Linn. Soc. XXIX, 320.

Height of entire plant not exceeding 12 in. *Stem* sheathed at the base by two or three very unequal, wide, sheathing, sub-acute bracts. *Leaves* three, close together on the stem above the basal bracts, alternate, broadly ovate, sub-acute, sessile, sheathed, puberulous; length 1·25 to 1·75 in., breadth ·85 to 1·5 in. Peduncle slightly longer than the stem, puberulous, ebracteate, 1-flowered. *Flower* 2 in. in diam.; *floral bract* large, elliptic, cymbiform, sub-acute, ribbed and puberulous, about 2 in. long. Dorsal *sepal* elliptic, tapering to each end, the apex acute, 7-nerved; the lateral pair lanceolate, connate under the lip except at the apex. *Petals* narrowly elliptic, sub-acute, as long as the dorsal sepal. *Lip* longer than the sepals, very large,

ventricose, much inflated, not depressed, prominently nerved, the edges of the mouth coarsely crenulate. *Staminode* broadly and bluntly ovate, angled at the base. Franchet Cypriped. Asie Occ. et Orient., p. 10 (1894). *C. macranthon*, var. *ventricosa*, (*not of Swartz or Carriere*); Hook. fil. Fl. Br. Ind. VI, 170. *C. macranthos*, Sw., var. *tibeticum*, Kräntzlin Orch. Gen. et Spec. I, 26.

Sikkim, in the Lachen Valley, at an elevation of about 10,000 feet; in flower during July; Pantling No. 386.

The colour of the flowers is brownish, the lip being flushed near its mouth with bright purple.

PLATE 447.—*Cypripedium tibeticum*, King. Two plants, *of natural size*. Fig. 1 front view of staminode, 2 profile view of anther, staminode and stigma; *both enlarged*.

4. CYPRIPEDIUM HIMALAICUM, Rolfe in Journ. Linn. Soc. XXIX, 319.

Height of plant 8 to 12 in. *Stem* clothed at the base by three or four unequal, lax, tubular, acute sheaths, ·5 to 1·75 in. long. *Leaves* three, unequal, the lowest the smallest, scattered, from oblong-elliptic to broadly-elliptic, acute, slightly narrowed to the sheathing base, puberulous; length of the larger leaves 2·5 to 3·5 in., breadth 1 to 2 in., the lower leaf only 1·5 to 2 in. long and less than ·5 in. broad; upper part of the stem 3 to 5 in. long, pubescent, bearing at its apex a single flower 2·5 in. in diam. vertically, and less than 2 in. horizontally; *floral bract* narrowly-elliptic, acute, slightly concave, longer than the flower, many-nerved, 2 in. long. Dorsal *sepal* broadly ovate, acute, somewhat concave, the lateral pair slightly longer but only one-third as wide, connate under the lip. *Petals* spreading, narrowly oblong, sub-acute, longer than the dorsal sepal. *Lip* pendent, sub-cylindrically ventricose, many-nerved; the mouth wide, crenate. *Staminode* broadly ovate, blunt, slightly cordate at the base. *C. macranthon*, Hook. fil. Fl. Br. Ind. VI, 170, in part (*not of Swartz*). *C. macranthos*, Sw., var. *himalaicum*, Kräntzlin Orch. Gen. et Spec. I, 26.

Bhotan, in the Chumbi Valley, at an elevation of about 12,000 feet; in flower during July. Lachen Valley, alt. 10,000 to 12,000 feet; Pantling No. 373.

The colour of the flower is brownish, the lip having a strong tinge of purple.

PLATE 448.—*Cypripedium himalaicum*, Rolfe. Two plants, *of natural size*. Fig. 1 front view of staminode, 2 profile view of staminode, anther and stigma; *both enlarged*.

H. P. and C. E. G.—Reg. No. 1720J—340—10-2-98.

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Drawn by R. Pantling.

OBERONIA PRAINIANA, King & Pantling.

Lith. by K. D. Chandra.

OBERONIA EMARGINATA, King & Pantling.

Lith. by K. P. Dass.

OBERONIA LOBULATA, King & Pantling.

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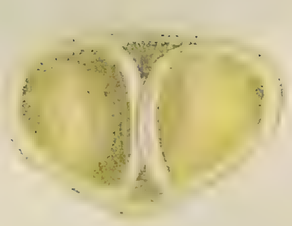

3

4

Drawn by R. Pantling.

OBERONIA PACHYRACHIS, Reichb.fil.

Lith. by K. D. Chandra.

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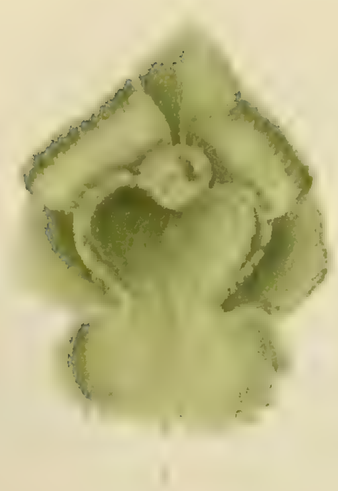
Drawn by R. Pantling.

OBERONIA PACHYPHYLLA, King & Pantling.

Lith. by A. C. Singha.



Drawn by R. Fasoul.

ORCHRONIA MICRANTHA, King & Pantling.

Lith. by G. C. Dass.

Ann. Roy. Bot. Garden. Calcutta, Vol. 8, PLATE 6.

OBERONIA CROFTIANA, King & Pantling.

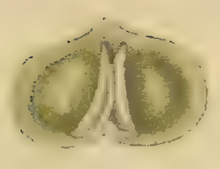
Lith. by A. L. Singh.

OBERONIA PARVULA, King & Pantling.

Drawn by R. Pantling.

1

2



3

4

Drawn by R. Panthing.

Lith: by Chitra Silpi Co

OBERONIA JENKINSIANA, Griff. mss.

1

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4

5

Drawn by R. Pantling.

OBERONIA IRIDIFOLIA, Lindl.

Lith. by B. K. Roy.

1

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OBERONIA ~~FERRUGINEA, Parish.~~
ENSIFORMIS, Lindl.

Drawn by R. Pantling.

Lith. by P. N. Sinha.

1

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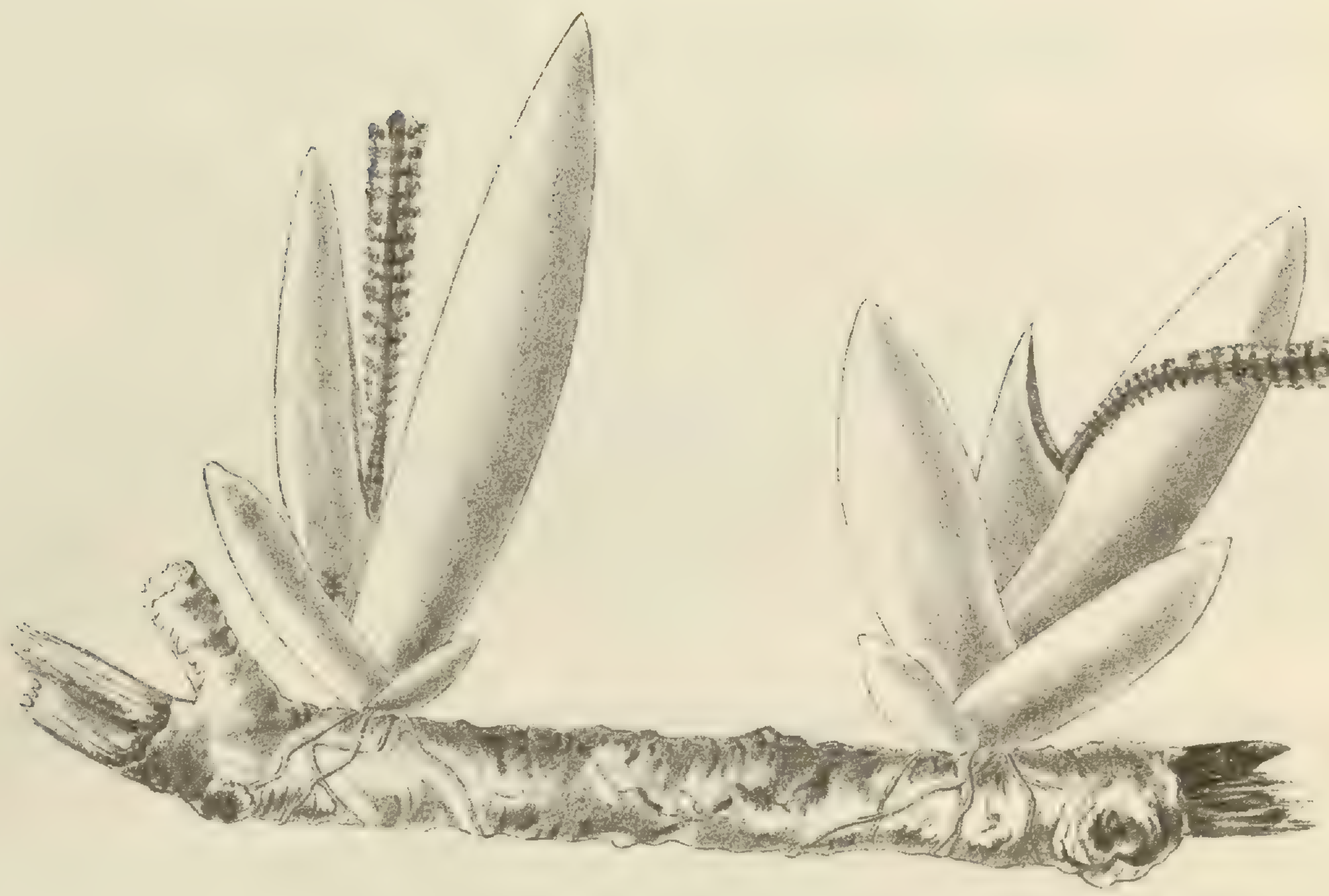

3

4

Drawn by P. Farthing

OBERONIA DEMISSA, Lindl.

Lith: by Chitra Silpi Cº

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Drawn by R. Pantling.

OBERONIA OBCORDATA, Lindl.

Lith: by D. N. Chowdhury.

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Drawn by R. Pantling.

OBERONIA MYRIANTHA, Lindl.

Lith. by B. K. Roy.

1

1

A

Drawn by R. Pantling.

OBERONIA LONGIFOLIA, King & Pantling.

OBERONIA CAULESCENS, Lindl.

B

3

Lith: by A. D.

OBERONIA FALCATA, King & Pantling.

1

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6

Drawn by R. Panthing

OBERONIA RUFILABRIS, Lindl.

Lith: by A. C Singha.

A

Drawn by R. Pantling.

OBERONIA AURICULATA, King & Pantling.

B

OBERONIA PYRULIFERA, Lindl.

Lith. by A. C. Mukerjei.

1

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Drawn by R. Pantling.

MICROSTYLIS KHASIANA, Hook: fil

Lith: by Chitra Silpi C°

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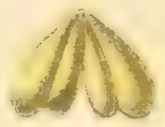

6

Drawn by K. Pantling.

MICROSTYLIS WALLICHII, Lindl.

Lith: by K. P. Dass.

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Drawn by R. Pantling.

Litho. by K. D. Lahiri.

MICROSTYLIS WALLICHII, Lindl.

var. BILOBA.

Drawn by R. Pantling.

MICROSTYLIS SCOTTII, Hook. fil.
= M. CALLOSUM, Reichb. fil.

Lith. by P. N. Sinha.

1.

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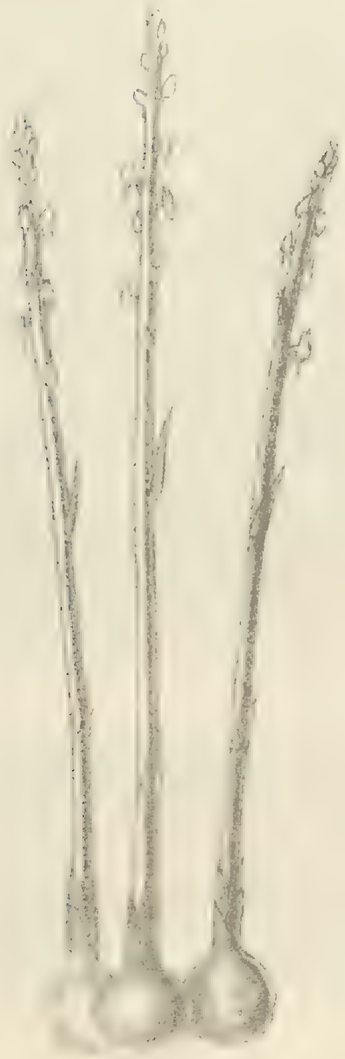

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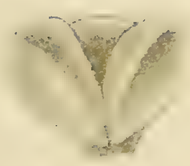
5

Drawn by R. Panthing.

MICROSTYLIS SAPROPHYTA, King & Panthing.

Lith. by B. K. Roy.



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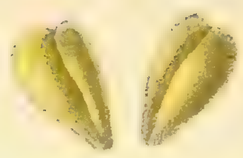

4

Drawn by R. Pantling.

MICROSTYLIS APHYLLA, King & Pantling.

Lith. by G. C. Dass.

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6

Drawn by R. Pantling.

MICROSTYLIS CONGESTA, Reichb. fil.

Lith. by A. C. Singha.

Drawn by R. Pantling

Lith. by Chitra Silpi Cº

MICROSTYLIS CYLINDROSTACHYA, Reichb. fil.

1

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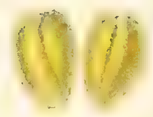


5

Drawn by F. Fantin.

MICROSTYLIS MUSCIFERA, Ridley.

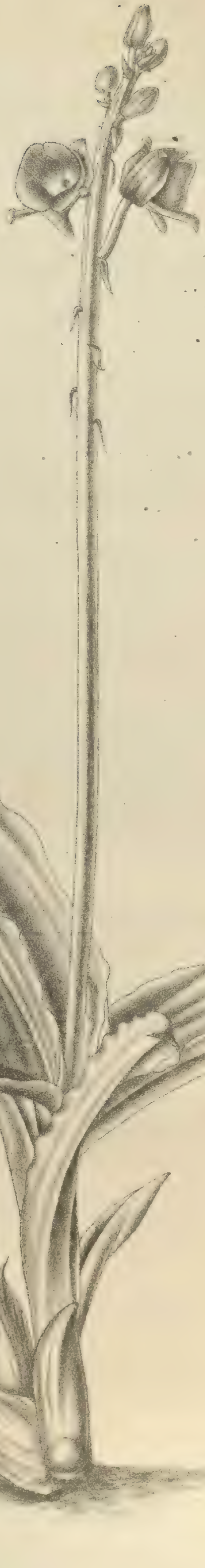
Lith. by H. D. Bose.

Drawn by H. Pantling

MICROSTYLIS MAXIMOWICZIANA, King & Pantling.

Lith. by Thacker Spink & Co.

1



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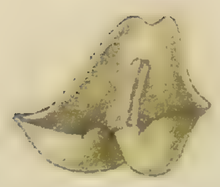


3

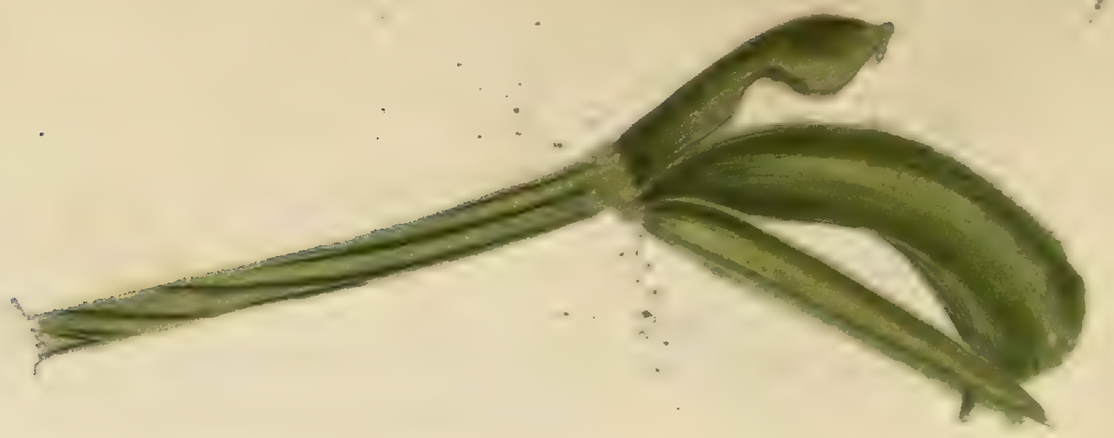
4

Drawn by R. Pantling.

MICROSTYLIS JOSEPHIANA, Reichb. fil.

Lith: by A. C. Singha.

1



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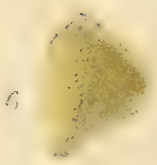

6

Drawn by R. Panthing.

LIPARIS CORDIFOLIA, Hook. fil.

Lith. by A. Singha.

Drawn by R. Pantling.

LIPARIS GAMBLEI, Hook. fl.

Lith. by A. C. Singha.

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Drawn by T. Pantling.

LIPARIS CATHCARTII, Hook. fil.

Lith: by Chitra Silpi Cº

Drawn by F. Pantling.

LIPARIS DEFLEXA, Hook. fil.

Lith. by A. D. Molla.

R. Pantling del.

LIPARIS NEPALENSIS, Lindl.

Lith. by A.C. Chowdry.

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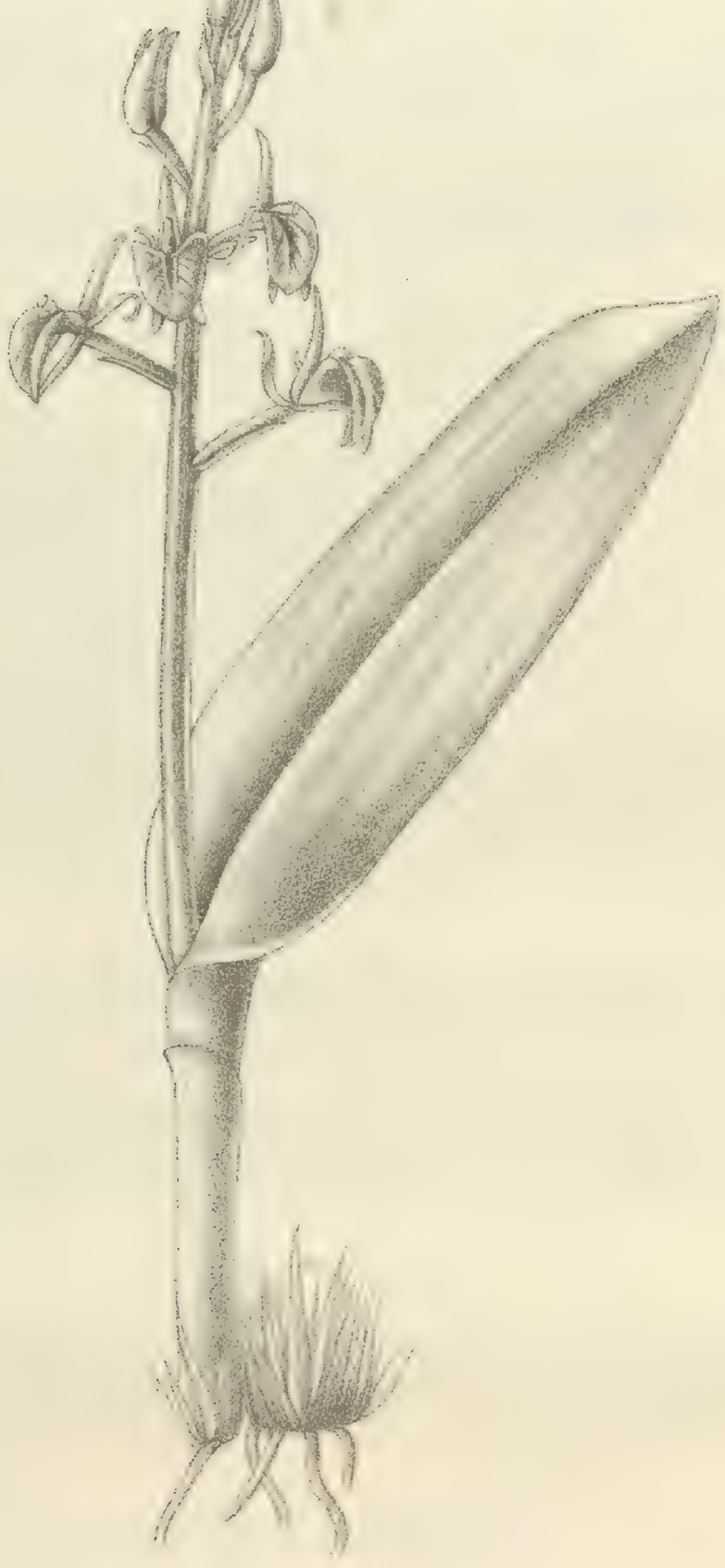

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5

Drawn by R. Pantling.

LIPARIS GLOSSULA, Reichb. fil.

Lith. by A. C. Singha.

Drawn by R. Pantling.

LIPARIS PARADOXA, Reichb. fil.

Drawn by R. Pantling.

LIPARIS ~~ODONTOSTOMA, Reichb. fil.~~

BITUBERCULATA, Lindl.

Lith: by A. C. Singha.

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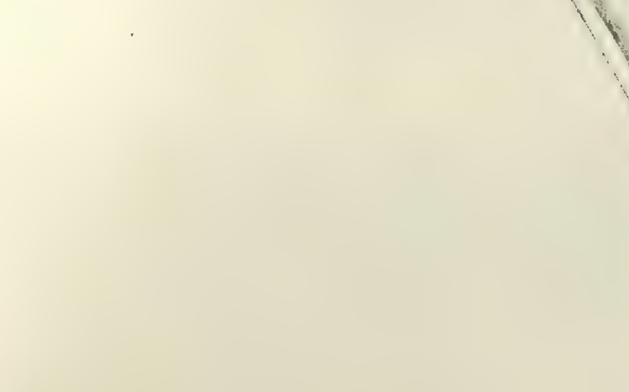
Drawn by R. Pantling.

EPARIS PLANTAGINEA, Lindl.

Lith. by A. C. Smythies



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Drawn by R. Panthing.

LIPARIS LONGIPES, Lindl.

Lith. by H. D. Bose.

Drawn by K. Panting

LIPARIS LONGIPES, Lindl. var. SPATHULATA, Ridl.

Litho by New Calcutta Sept. 08

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Drawn by R. Pantling

LIPARIS BISTRIATA, Par. & Reichb. fil.

Lith: by A. C. Singha.

LIPARIS BOOTANENSIS, Griff.

Litt. by New Chitra Silpi Co.

Drawn by F. Pantling

LIPARIS PUSILLA, Ridley.

Lith: by Chitra Silpi Co

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Drawn by R. Pantling.

LIPARIS DUTHIEI, Hook.fil.

Lith. by P. N. Sinha.

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LIPARIS PERPUSILLA, Hook.fil.

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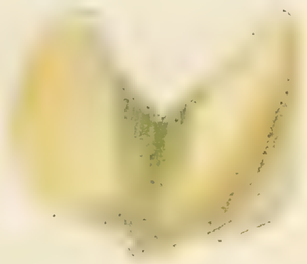
Drawn by R. Pantling.

LIPARIS PYGMÆA, King & Pantling.

Lith: by D. N. Chowdhury.



Drawn by R. Fantling. LIPARIS PLATYRACHIS, Hook. fil. Lith. by H. D. Bose.

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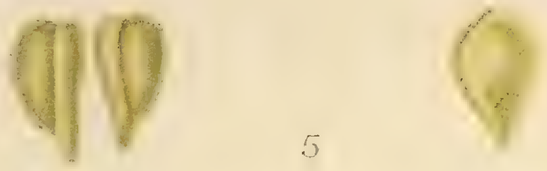

5

Drawn by R. Pantling.

LIPARIS DELICATULA, Hook. fil.

Lith: by P. N. Sinha.

Drawn by R. Pantling.

LIPARIS VIRIDIFLORA, Lindl.

Lith. by A. C. Mukerjei.

Drawn by R. Pantling.

LIPARIS RESUPINATA, Ridley.

Lith. by A. C. Singha.

Drawn by R. Pantling.

LIPARIS RESUPINATA, Ridley, VAR. RILLEYI, King & Pantling.

Lith. by A.

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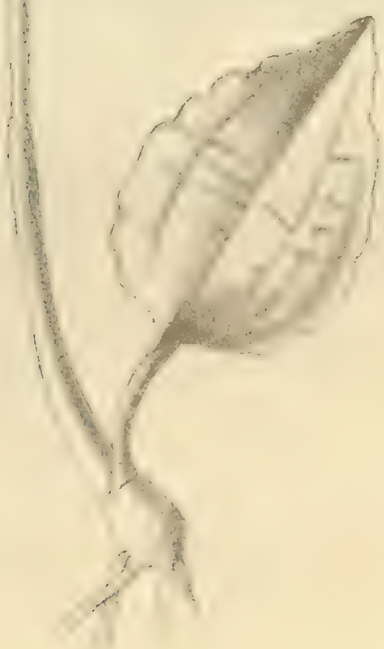
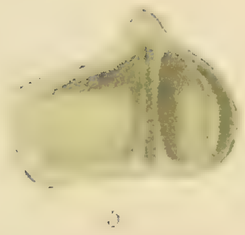




5

Drawn by R. Pantling.

DIDICIEA CUNNINGHAMII, King & Prain.

Lith: by G. C. Dass.

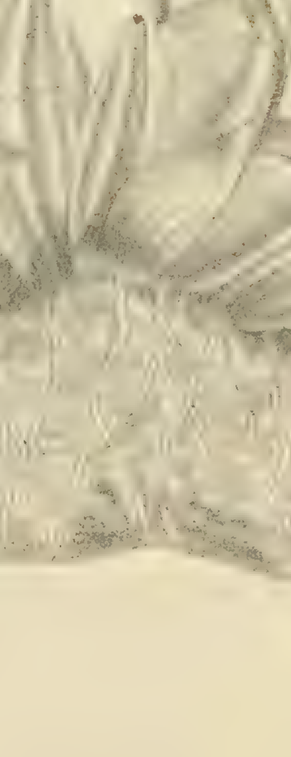
LIPARIS MANNII, Reichb. fil

LIPARIS GRIFFITHII, Ridley.

Drawn by S. Paddock.
Lith. by K.D. Chandra.

1

2



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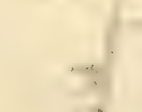


5

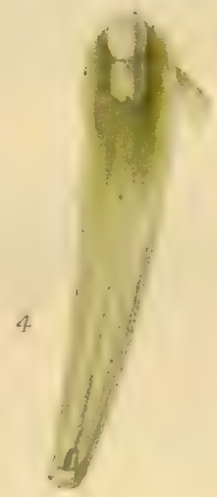
Drawn by K. Pantling.

LIPARIS ASSAMICA, King & Pantling.

Lith. by A. C. Mukerjei.

1

3



4

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6

Drawn by R. Pantling

DENDROBIUM ANCEPS, Swartz.

Lith. by A. C. Mukerjei.

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Drawn by R. Pantling.

DENDROBIUM TERMINALE, Parish & Reichb: f.

Lith by Chitra Silpi Cº.

5

Drawn by E. Pantling.

CIRRHOPETALUM GUTTULATUM, Lindl.

Lith. by A. D. Molla.

Drawn by R Pantling.

DENDROBIUM CATHCART[illegible]

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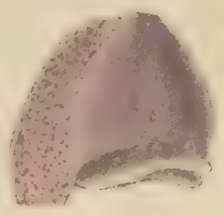

5

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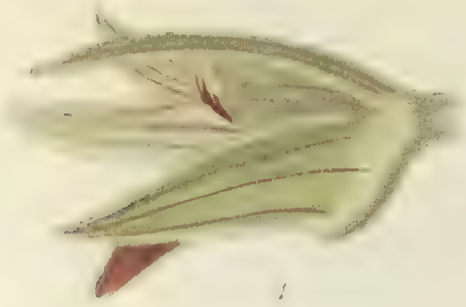
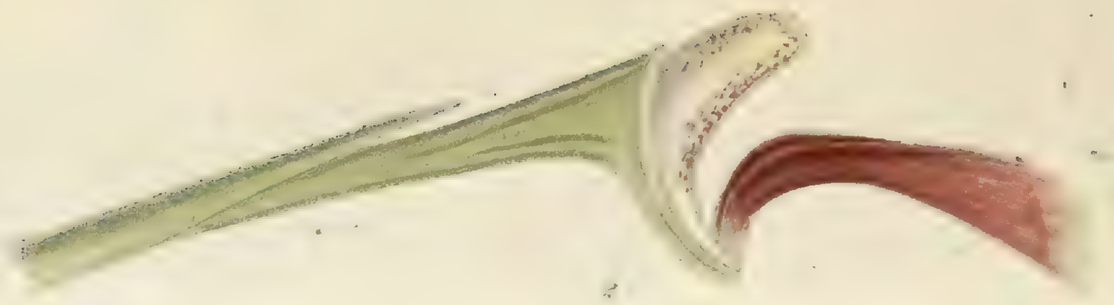
7

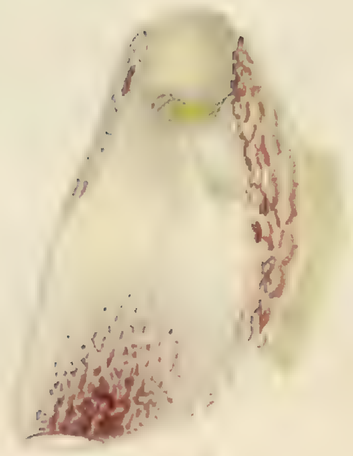
Drawn by P. Pantling

Lith: by Chitra Silpi Cº

DENDROBIUM PYGMŒUM, Lindl.







DENDROBIUM PORPHYROGLOSSUM, Lindl.

New Chitra Silpi Co.

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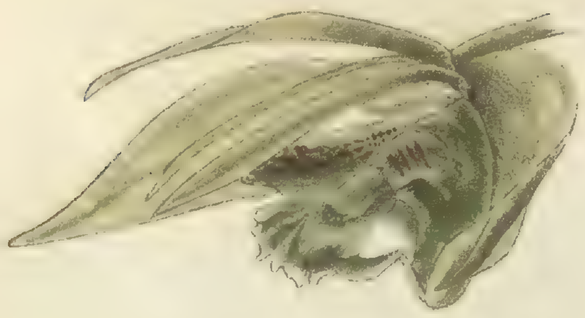
Drawn by R. Pantling.

DENDROBIUM CLAVATUM, Wall.

Lith: by A. D. Molla.



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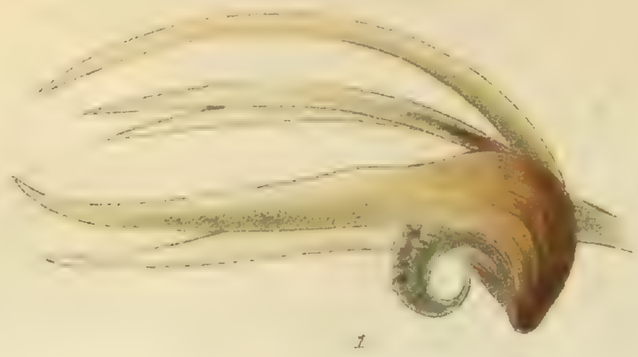
Drawn by R. Pantling.

DENDROBIUM ERIÆFLORUM, Griff.

Lith. by A. C. Mukerjei.



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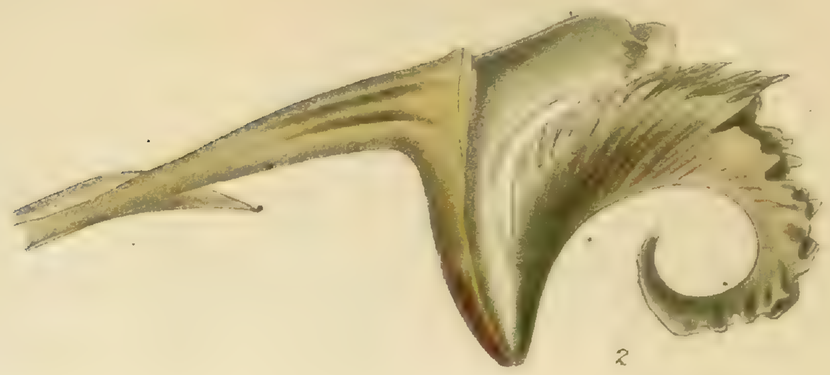

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6

Drawn by R. Pantling.

DENDROBIUM DENUDANS, Don.

Lith by A. L. Singh.

Drawn by R. Pantling.

LENDROBIUM [illegible]

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Drawn by R. Pantling.

Lith: by Chitra Silpi Co.

DENDROBIUM LONGICORNU, Lindl.

Drawn by R. Pantling.

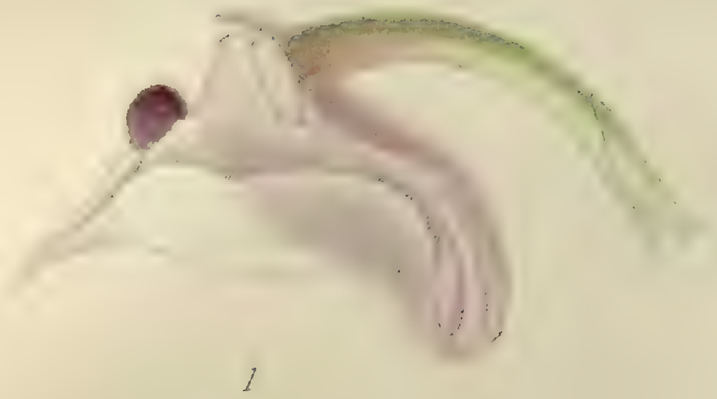
DENDROBIUM FORMOSUM, Roxb.

Lith by A. C. Singha.

Drawn by [illegible].

DENDROBIUM CREPIDATUM, Lindl.

Lith: by New Chitra Silpi Co.



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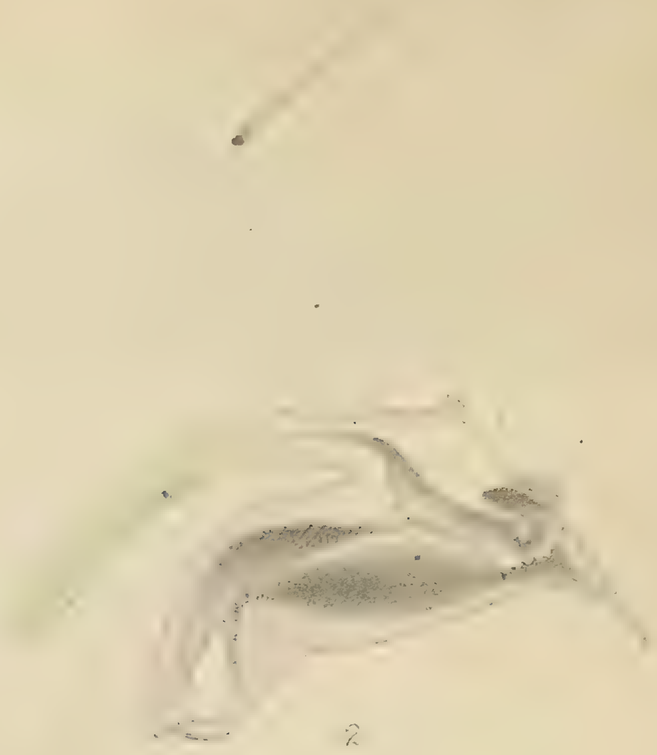

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Drawn by R. Pantling.

DENDROBIUM ADUNCUM, Wall:

Lith: by Chitra Silpi Cº

Drawn by R. Pantling.

Lith: by Chitra Silpi Cº

DENDROBIUM SPATHACEUM, Lindl.
= D. CANDIDUM, Wall.

Drawn by R. Pantling.

DENDROBIUM AMŒNUM, Wall.

Lith. by A. C. Mukerjee

Drawn by R. Pantling.

DENDROBIUM TRANSPARENS. Wall.

Lith by Chitra Silpi Co.

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Drawn by R. Pantling.

DENDROBIUM NOBILE, Lindl.

Lith. by A. C. Mukerjei.

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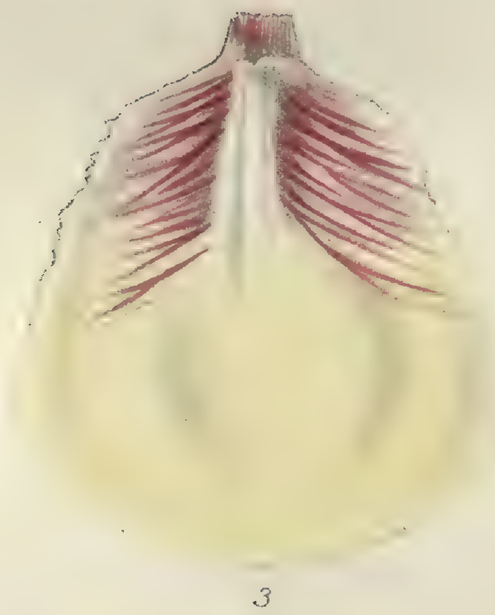

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4

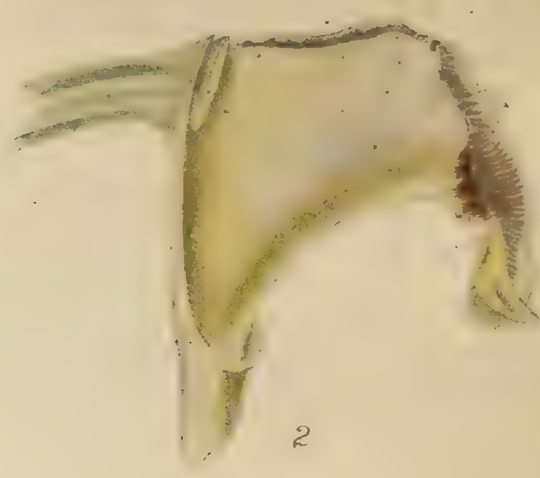
b

Drawn by K. Parkins.

DENDROBIUM PIERARDI, Roxb.

Litho by New Class Engr. Co.

1



2

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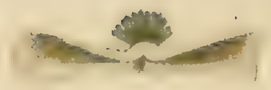

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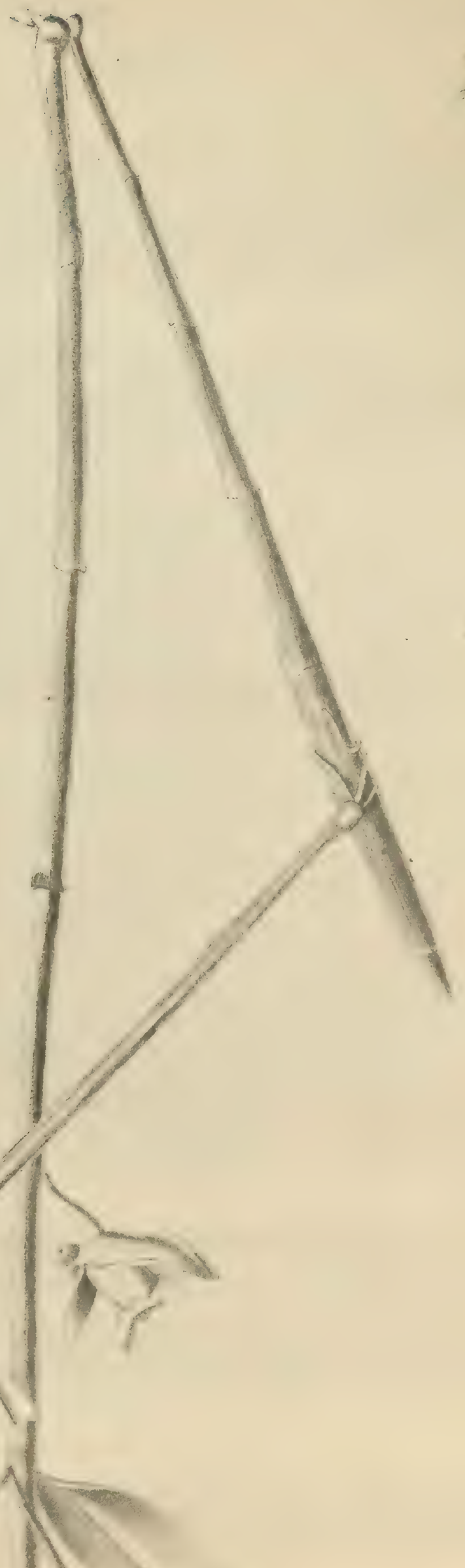

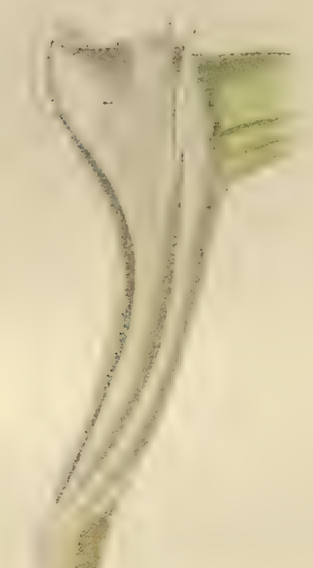

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8

Lith. by P N Sinha

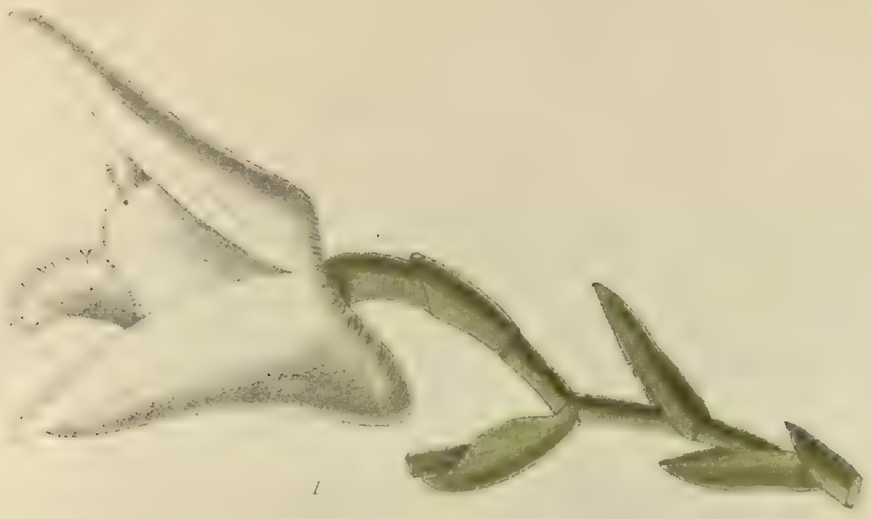
DENDROBIUM RUCKERI, Lindl.

= D. RAMOSUM, Wall.

Drawn by R. Pantling.

DENDROBIUM HETEROCARPUM, Wall

Lith. by Chitra Silpi C2



Drawn by R. Pantlingr

DENDROBIUM STUPOSUM, Lindl.

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Drawn by R. Pantling.

DENDROBIUM PAUCIFLORUM, King & Pantling.

Lith: by A. C. Singha.

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Drawn by R. Pantling.

DENDROBIUM CHRYSANTHUM, Wall.

Lith: by New Chitra Silpi Cº

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DENDROBIUM SULCATUM, Lindl.

Drawn by R. Pantling.

Lith. by New Chitra Silpi Co.

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Drawn by R. Pantling.

Lith by A. C. Mukerjei.

DENDROBIUM DENSIFLORUM, Wall.

DENDROBIUM FARMERI, Paxton.

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Drawn by R. Fantling. Lith. by Chitra Silpi Dr.

DENDROBIUM GIBSONII, Lindl.

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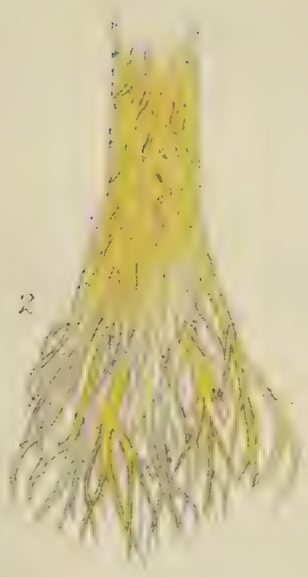
Drawn by N. Panthng.

DENDROBIUM FIMBRIATUM, VAR. OCULATUM, Hook.

Lith. by K. D. Chandra.

1



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4

R. Pantling del.

DENDROBIUM HOOKERIANUM, Lindl.

Lith. by A. C. Mukerjei

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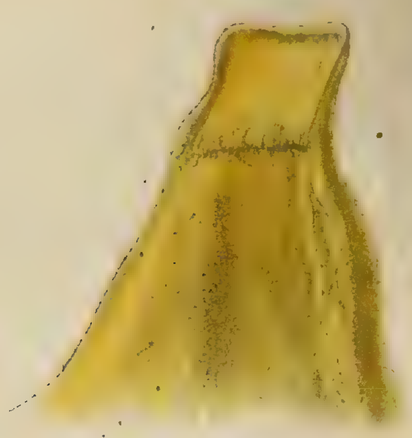
Drawn by K. Sandberg. Lith by B. K. Roy.

— D. MOSCHATUM, Wall.



Drawn by R. Pantling.

DENDROBIUM AGGREGATUM, Roxb.

Lith. by A. C. Mukerjéi.

P. Pantling del.

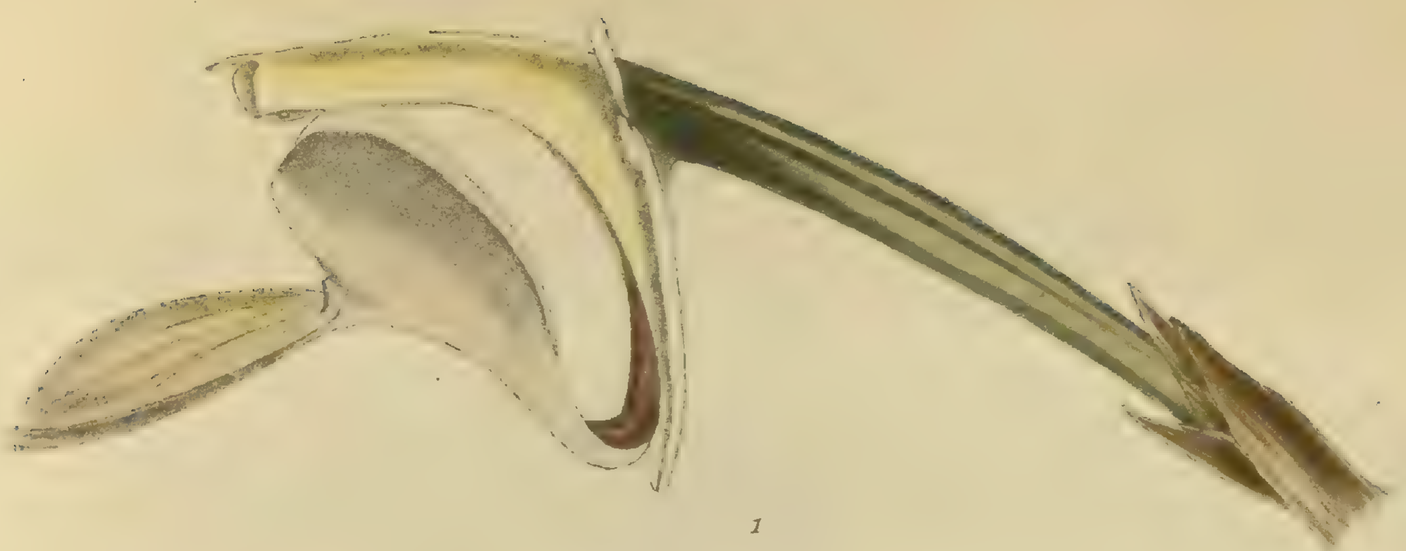
DENDROBIUM MACRAEI, Lindl.

Lith. by S. C. Mondul

Drawn by K. Panting.

DENDROBIUM ROTUNDATUM, Benth.

Lith. by D. N. Chowdhury.



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Drawn by R. Pantling

Lith: by Chitra Silpa Cº

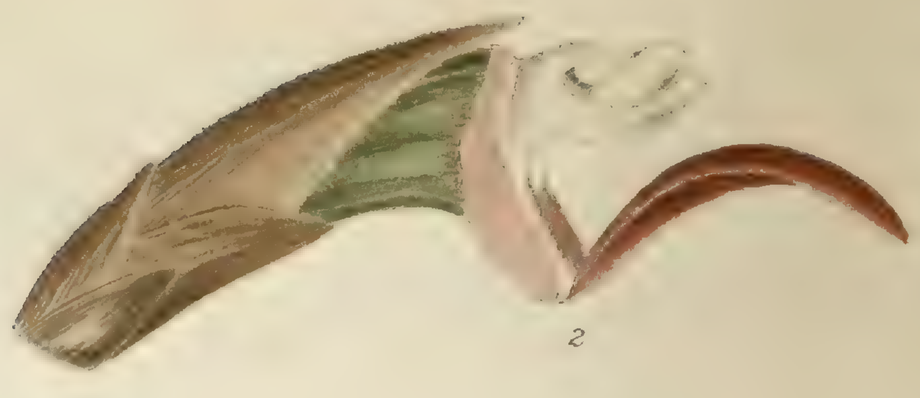
DENDROBIUM FUSCESCENS, Griff.

Drawn by R. Parkin.

Litho at Dept. Surv. Cal.

DENDROBIUM AMBLUM, Lindl.

1



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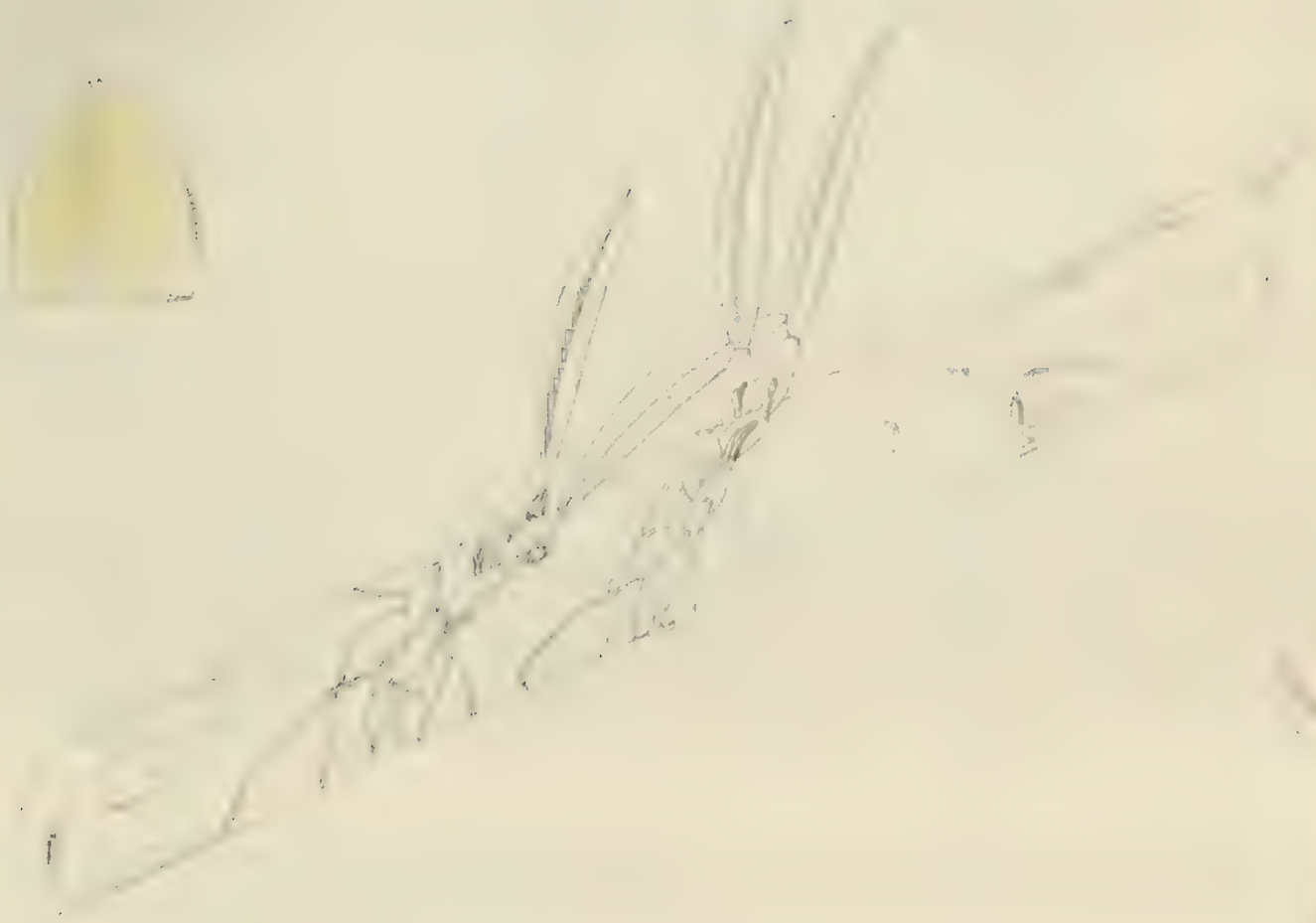

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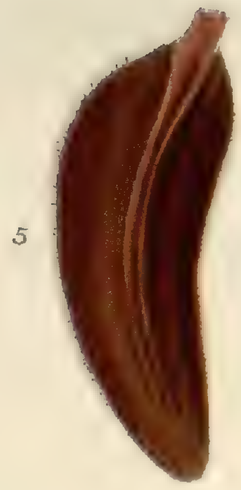

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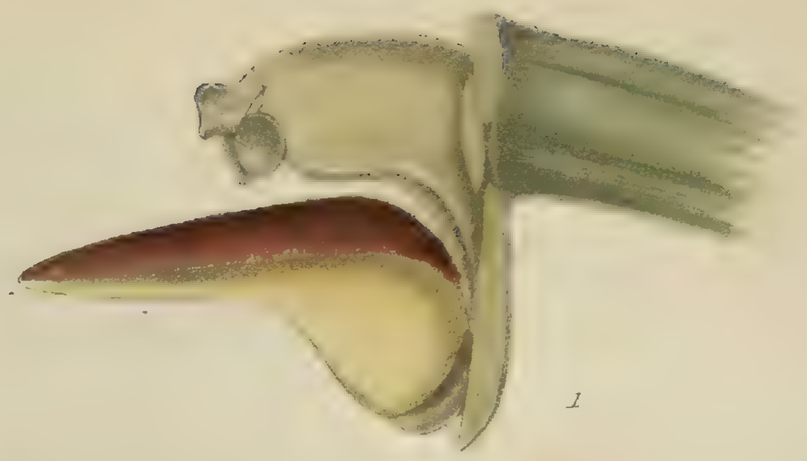
7

Drawn by R. Pantling.

BULBOPHYLLUM LISTERI, King & Pantling.

Lith. by B. K. Roy



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Drawn by R. Pantling

Lith: by Chitra Silpi Cº

BULBOPHYLLUM AFFINE, Lindl.

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Drawn by R. Pantling.

Lith. by A. C. Mukerjei.

BULBOPHYLLUM LEOPARDINUM, Lindl.

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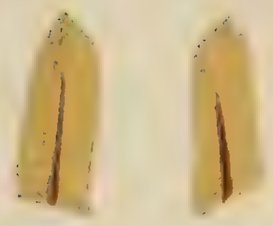

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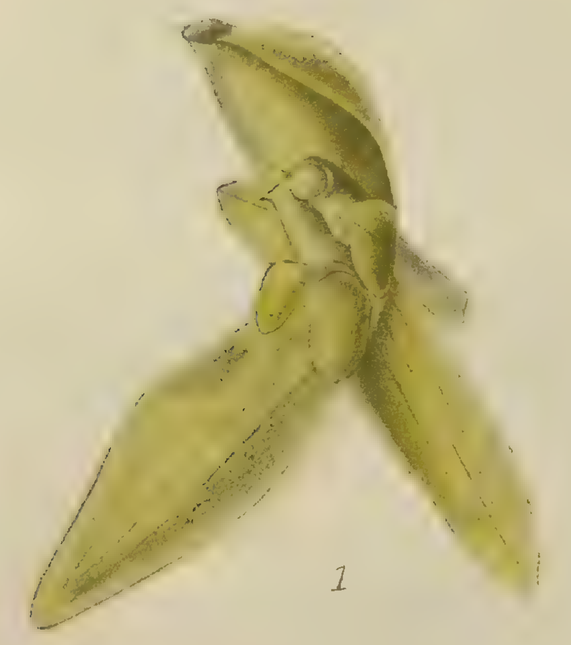
8

Drawn by R. Pantling.

Lith: by Chitra Silpi C.

BULBOPHYLLUM ~~-GONGHFERUM, Reich~~b. fil.

BULBOPHYLLUM RIGIDUM, King & Pantling.



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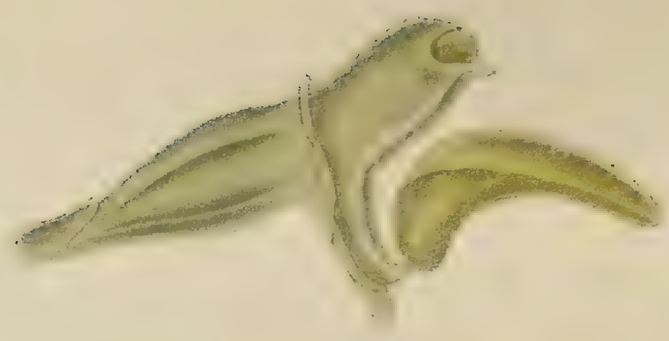

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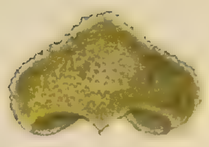

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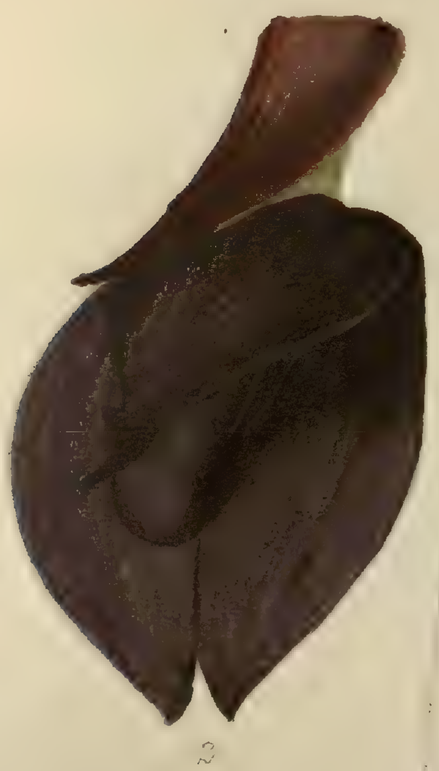
Drawn by R. Pantling.

Lith. by P. N. Simha.

BULBOPHYLLUM POLYRHIZUM, Lindl.



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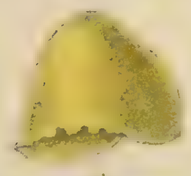
Drawn by H. Harding

BULBOPHYLLUM CYLINDRACEUM, Lindl.

Litho by A. H. Hodgson



Drawn by R. Pantling.

Lith: by Chitra Silpi Cº.

BULBOPHYLLUM CAREYANUM, Spreng.

Drawn by R. Pantling.

BULBOPHYLLUM TRISTE, Reichb. fil.

Lith. by Chitra Edgr. Co.

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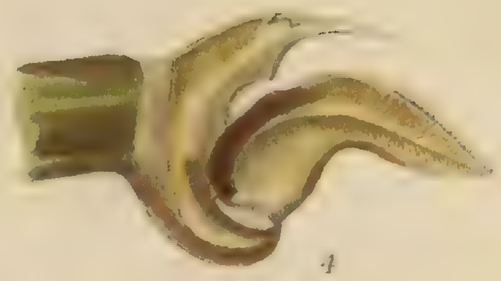

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Drawn by R. Pantling.

BULBOPHYLLUM BISETUM, Lindl.

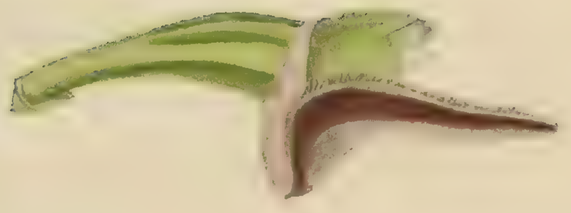
Lith: by B. K. Roy.

Drawn by R. Pantling.

Lith. by Chitra Silpi

BULBOPHYLLUM CORNU-CERVI, King & Pantling

1



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Drawn by R. Pantling.

BULBOPHYLLUM SECUNDUM, Hook. fil.

Lith. by Chitra Silpi Cº.

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Drawn by R. Panthing.

Lith. by K. D. Chandra.

BULBOPHYLLUM STRIATUM, Reichb. fil

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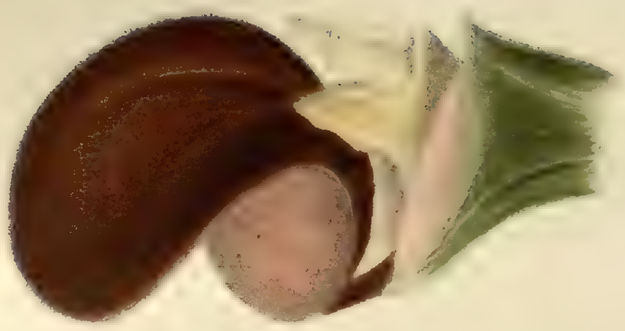

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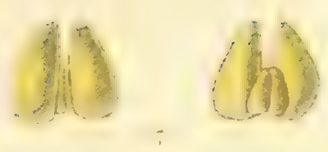

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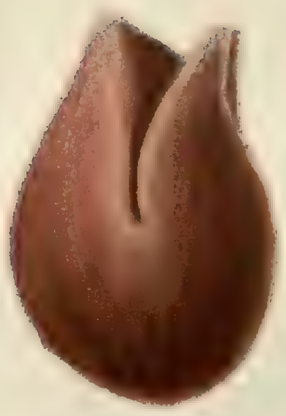
Drawn by R. Pantling.

BULBOPHYLLUM PILULIFERUM, King & Pantling.

Lith: by K. D. Chandra.

1

2



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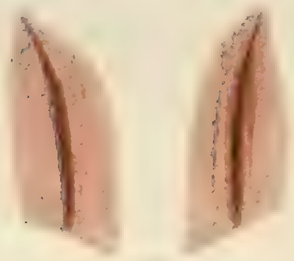

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7

Drawn by R. Panting.

BULBOPHYLLUM GRACILIPES. King & Panting

Lith. by A. C. Singha

1

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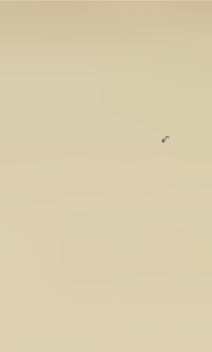

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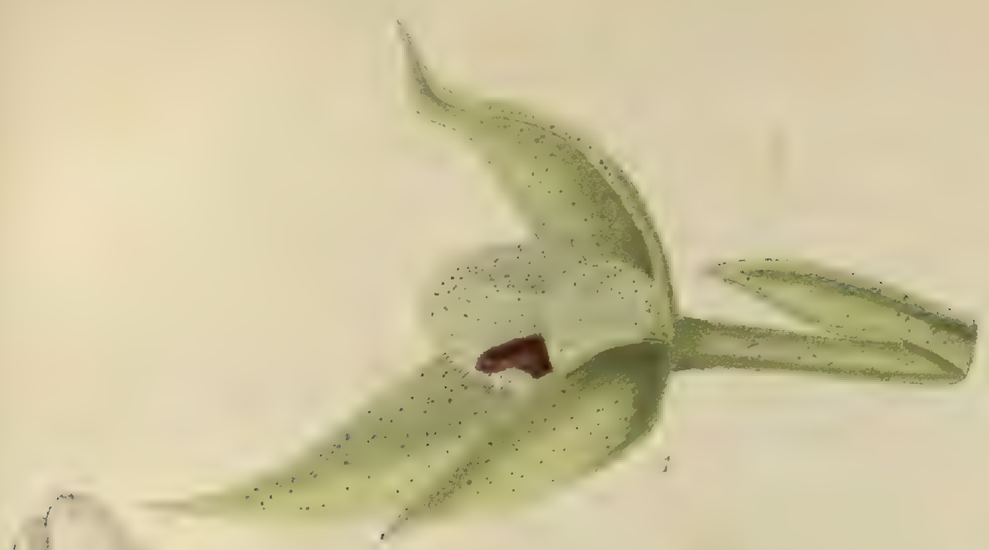
7

Drawn by R. Pantling.

BULBOPHYLLUM REPTANS, Lindl.

Lith. by A. C. Mukerjei.



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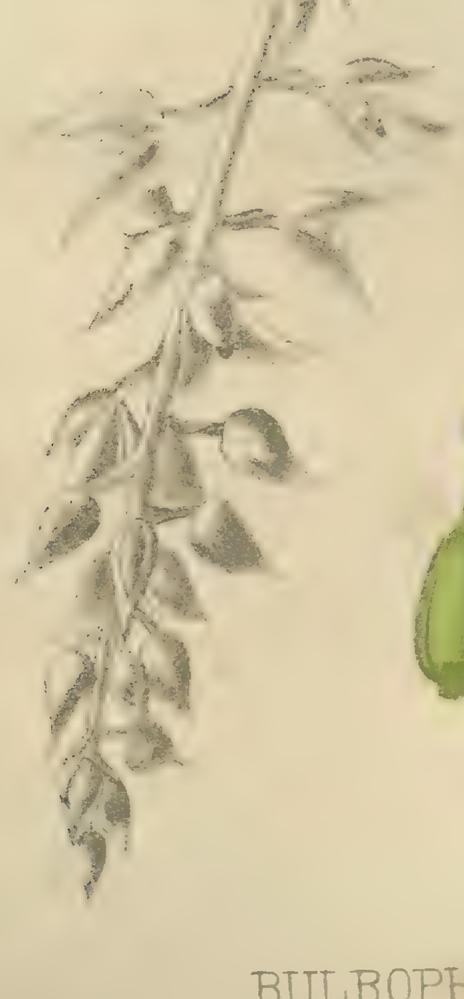

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Drawn by R. Panthing.

Lith. by K. D. Chandra.

BULBOPHYLLUM EUBLEPHARUM, Reichb. fil.

Drawn by K. Parkinson

BULBOPHYLLUM [illegible]

Lith: by New Chira Silpi Co

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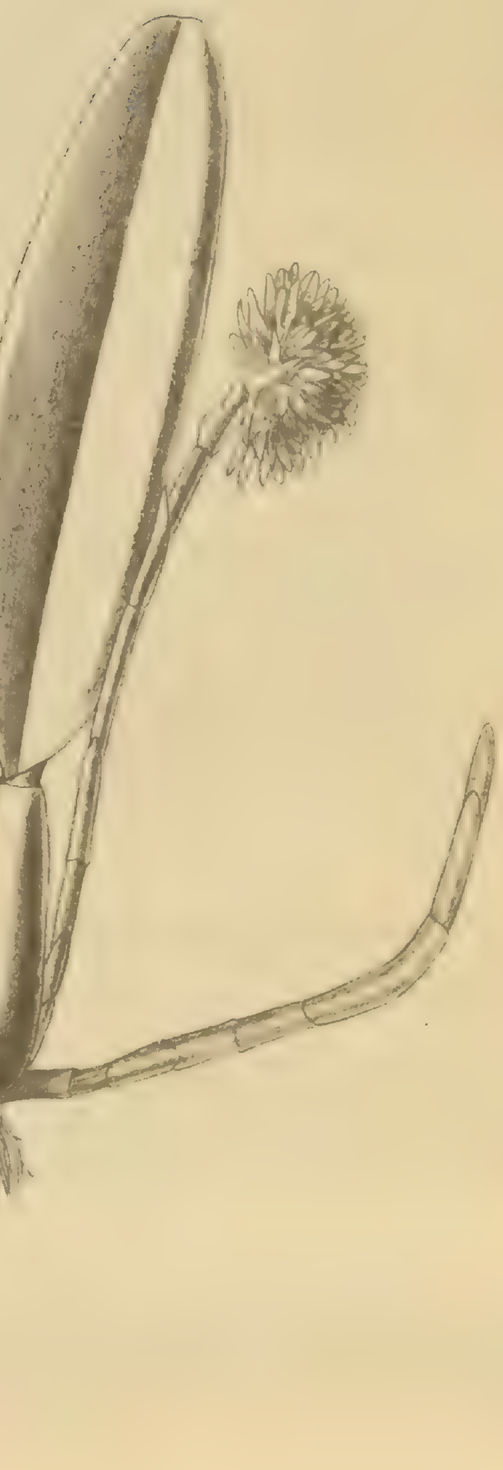

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7

Drawn by R. Pantling.

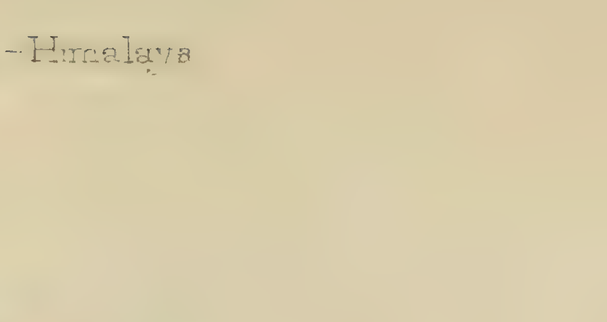
Lith: by K. D. Chandra.

BULBOPHYLLUM ODORATISSIMUM, Lindl.

Drawn by F. Pauling

Chitra Silpi Cª

2



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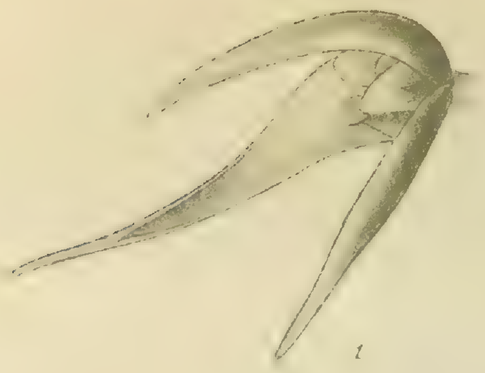
Drawn by R. Panthing

Lith: by Chitra Silpi C°

BULBOPHYLLUM PROTRACTUM, Hook. fil:



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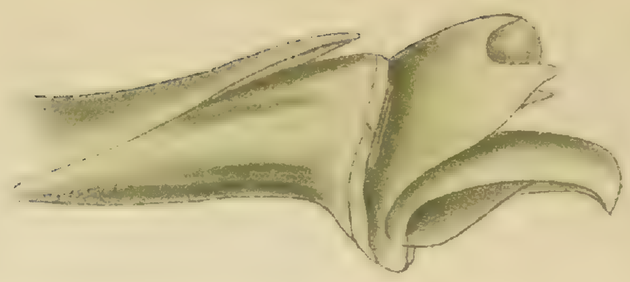

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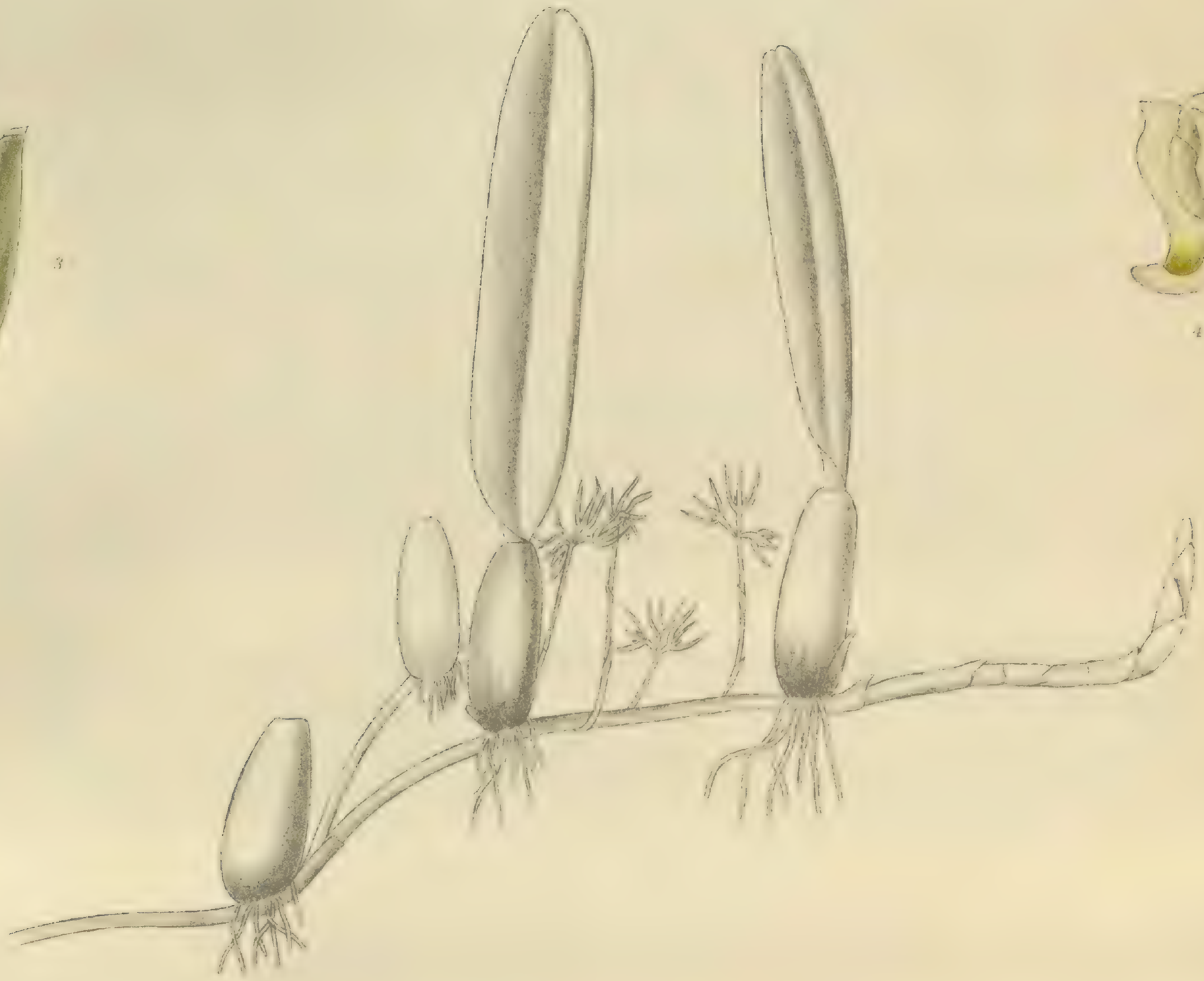

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7

Drawn by F. Parkinson.

BULBOPHYLLUM LEPTANTHUM, Hook fil.

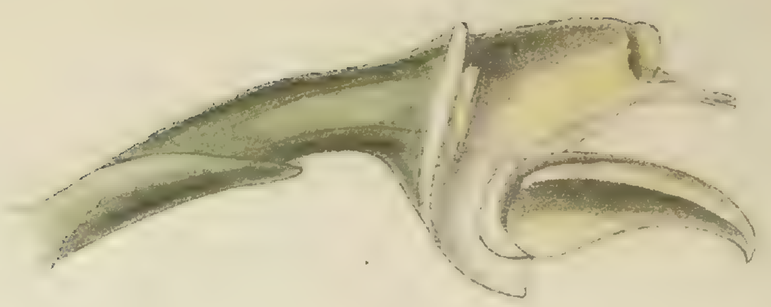
Lith. by New Chitra Stipl. Co

Drawn by R. Pantling.

Lith. by A. C. Singha.

BULBOPHYLLUM GAMBLEI, Hook. fil.

1



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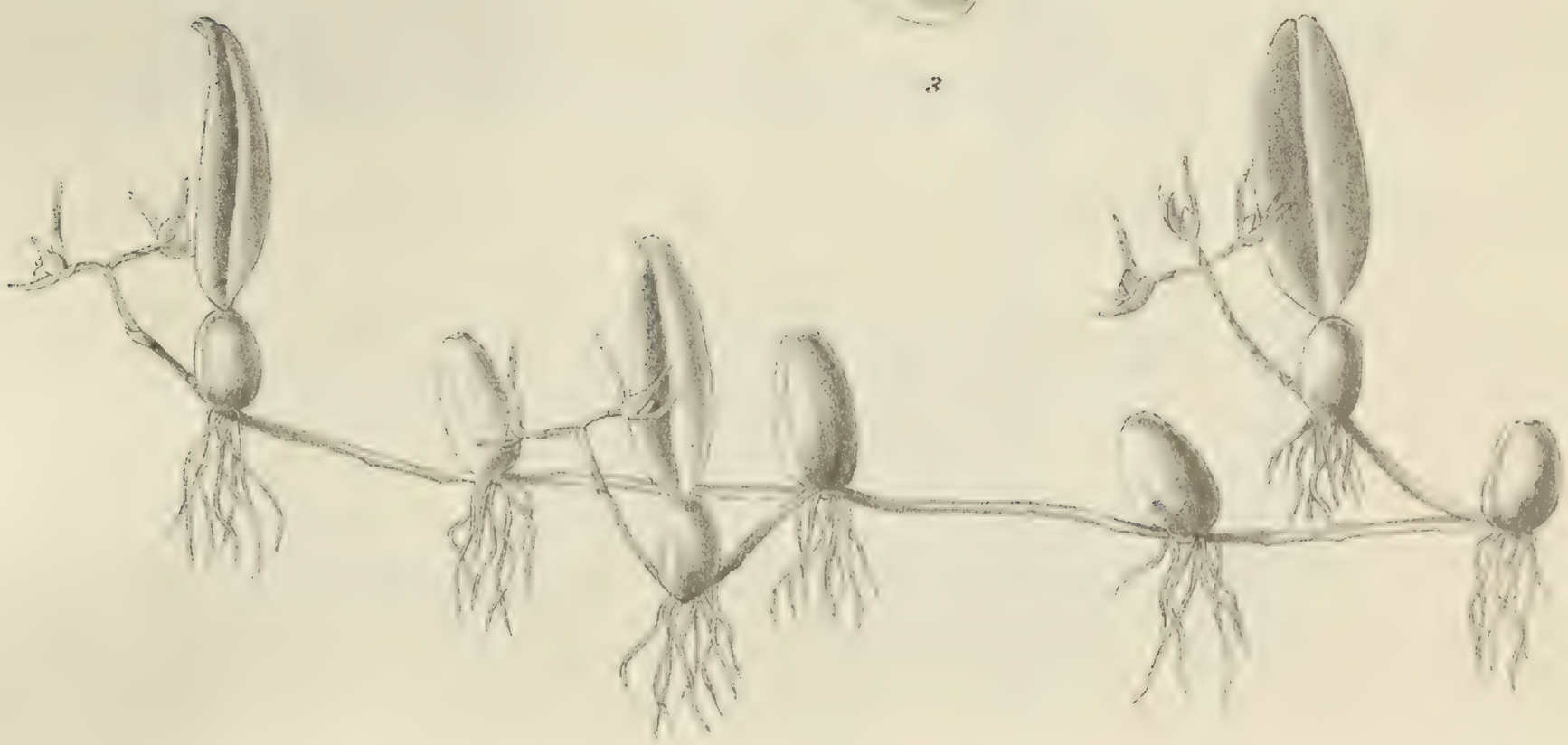

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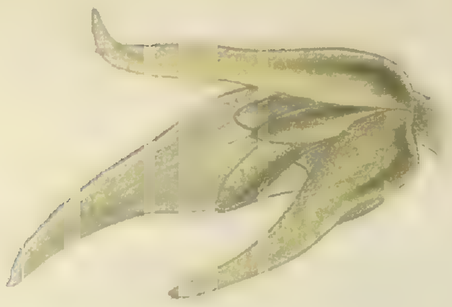
6

Drawn by R. Pantling.

BULBOPHYLLUM CLARKEANUM, King & Pantling.

Lith by Chitra Silpi C°



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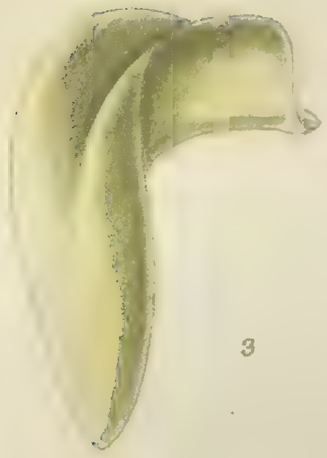

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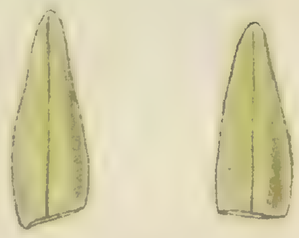

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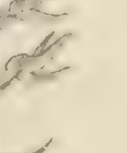
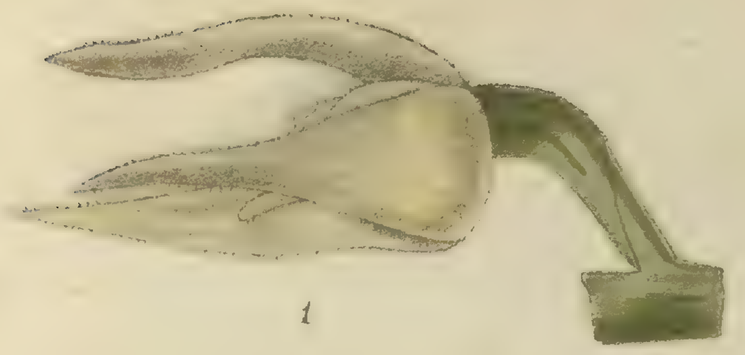


6

Drawn by R. Pantling.

Lith: by Chitra Silpi Cº

BULBOPHYLLUM EBULBUM, King & Pantling.



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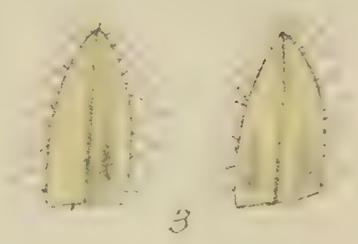

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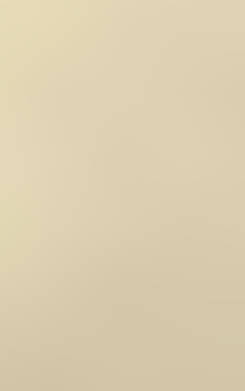
Drawn by R. Pantling.

Lith. by B. K. Roy.

BULBOPHYLLUM THOMSONI, Hook. fil.

1



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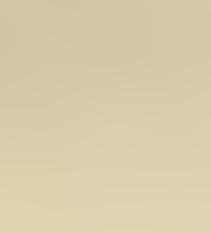

5

Drawn by R. Pantling.

BULBOPHYLLUM HIRTUM, Lindl.

Lith. by P. N. Sinha.

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Drawn by R. Pantling.

CIRRHOPETATUM VIRIDIFLORUM, Hook: fil.

Lith: by Chitra Silpi Cº

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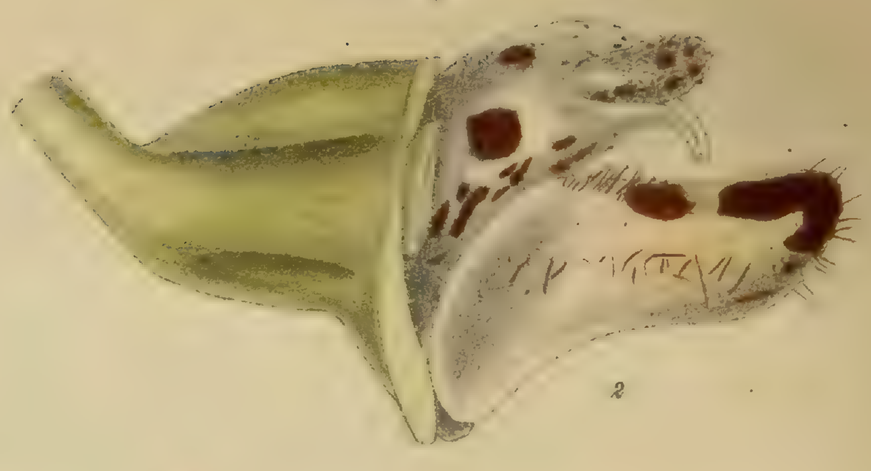

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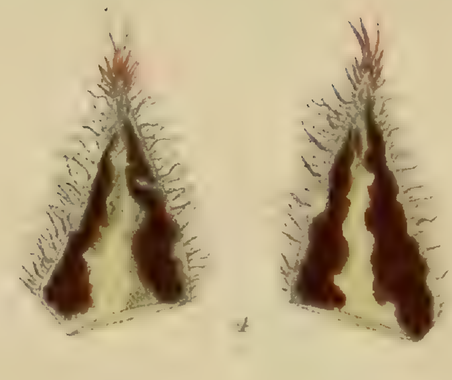

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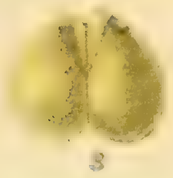

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Drawn by R. Pantling.

CIRRHOPETALUM REFRACTUM, Zollinger.

Lith. by A. C. Singha.

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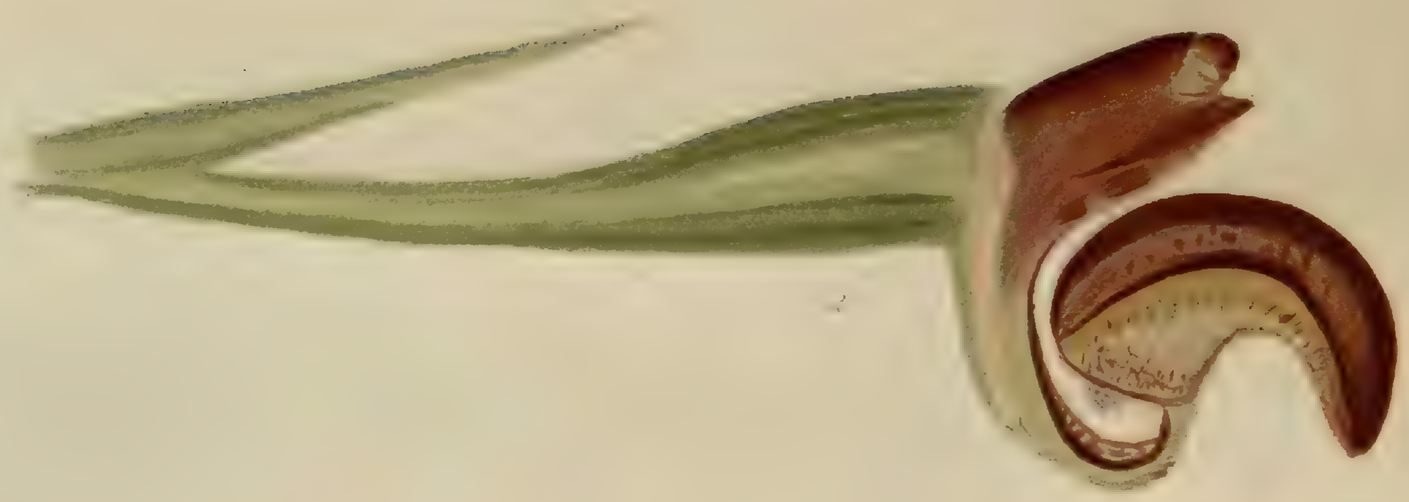
CIRRHOPETALUM CORNUTUM, Lindl.

Drawn by R. Pantling.

Lith: by Chitra Silpi Co



Drawn by R. Pantling.

CIRRHOPETALUM WALLICHII, Lindl.

Lith. by New Chitra Silpi Co.

Drawn by R. Pantling.

CIRRHOPETALUM BREVIPES, Hook.fil.

Lith: by A. C. Singha.

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Drawn by R. Pantling.

CIRRHOPETALUM BOOTANENSE, ~~Griff.~~ Hook. fil.

Lith. by Chitra Silpi C^t

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Drawn by A. Fleming.

CIRRHOPETALUM ANDERSONII, Hook.fil.

Litho by P. N. Sirkar.

Drawn by R. Pantling.

CYPRIOPEDILUM ROXBURGHII, Lindl.

C. SIKKIMENSE, K. & P.

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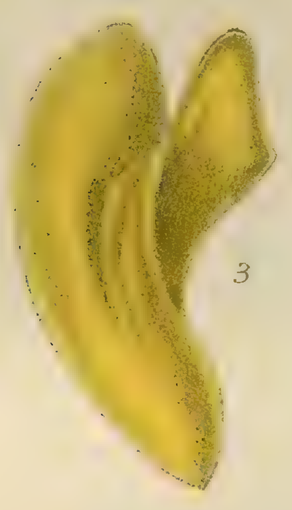
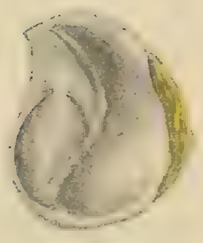
Drawn by P. Prabhu.

CIRRHOPETALUM SARCOPHYLLUM, King & Prain.

Litho. by N. K. Roy.





Drawn by R. Pantling.

CIRRHOPETALUM CŒSPITOSUM, Wall.

Lith. by A. C. Singha.

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Drawn by R. Pantling.

CIRRHOPETALUM PARVULUM, Hook.fil.

Lith: by A.C. Singha.

CIRRHOPETALUM CAUDATUM, Ker. & Parsons.

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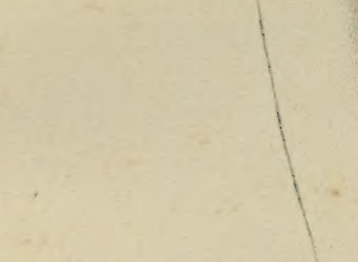

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Drawn by R. Pantling.

CIRRHOPETALUM ELATUM, Hook. fil.

Lith. by P. N. Sinha.

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Drawn by R. Pantling.

CIRRHOPETALUM GUTTULATUM, Hook. fil.

Lith. by A. C. Singha.

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Drawn by R. Pantling.

CIRRHOPETALUM MACULOSUM, Lindl.

Lith. by New Chitra Silpi Co.

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R. Pantling del.

CIRRHOPETALUM ORNATISSIMUM, Reichb.fil.

Lith: by A. C. Singha.